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POSTING ON PRIVATE LANDS IN NEW YORK STATE[1]

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ABSTRACT

A survey of the nature, extent and reasons for the posting of private lands against trespass for hunting and fishing was made during the years 1962, 1963 and 1964. The work was done chiefly in upstate New York, and a more general survey was made on Long Island because of the radically different conditions there. A summary of the history of the posting problem in the State and legislation relating to it is also given.

In the upstate area towns having a population of less than 150 per square mile were primarily considered. A random sample of 100 such towns, apportioned among the State Conservation Department's administrative regions according to relative hunting pressure, was selected. The survey was divided into two parts. Phase I was a non-interview approach during which the roads in each town were traversed by a conservation officer who recorded specified information for each parcel of posted land he encountered. During Phase II randomly selected owners of posted parcels in each town, representing different types of ownership, were interviewed regarding their motives for posting and other aspects of the problem.

There were 764 towns in upstate New York with a population of less than 150 per square mile. They constituted 84.1 per cent of the total area. The 100-town sample comprised 3,230,694 acres or 12.1 per cent of the area of the 764 towns, and 2,668,114 acres, or 82.5 per cent of it, were private lands. There were 4,176 parcels of posted land recorded during Phase I of the survey, and 361 owners of posted land were interviewed during Phase II.

The data indicated that 26 per cent of the area in private ownership was posted. The degree of posting was greatest in the vicinity of the large cities and related suburban areas. Of the posted parcels recorded, 3,393 (81 per cent) were posted by the actual owner, while 783 (19 per cent) were posted by second-party owners. Only 58 per cent of the parcels were legally posted, absence of names and addresses on the posters being the most frequnt violation.

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Unfavorable experiences with respect to the behavior of hunters on their land constituted the underlying cause of posting for most of the landowners interviewed. Some, however, first posted at the request of others (second parties). More specifically, desire for protection from large groups of hunters was the chief reason given. Other major reasons were desire for personal and family safety, shooting near buildings and livestock, damage to fences, buildings and crops, and concern over not having an equal chance with other hunters to harvest the game on their own land. Hunters entering without permission "as if they owned the land" was also a problem. Only 50 per cent of the owners would allow hunting by strangers if the hunter requested permission, whereas 83 per cent would allow access to friends and relatives.

Only 14 per cent of the owners interviewed had heard of the Fish and Wildlife Management Act program, and only one was a participating cooperator. And, when the objectives of the program were discussed with them, the majority were reserved or uninterested. With respect to posting, the owners generally preferred to regulate and control their own lands. On the other hand, an investigation of non-posting landowners might reveal a different philosophy toward posting.

It is apparent that, although some owners post their land for other reasons, the great majority have taken this step because of specific abuses of their hospitality. If these could be prevented, the rate of posting might be slowed, and some present posting might be eliminated. Any solution rests primarily on improvement in hunter behavior.

National surveys have determined that one-third of all American families are interested in hunting and fishing. It is also estimated that about one million more Americans become interested each year (Anonymous, 1963). As the population continues to expand there will be an even greater demand on already overtaxed hunting and fishing opportunities. Much of the best hunting and some fishing are to be found on private agricultural lands. It is the farmers, and rural residents with large blocks of land, who are the principal custodians of our wildlife. In New York, as in most states, we are dependent upon the voluntary cooperation of these landowners to open their lands and waters to the public for recreational use.

While most sportsmen who use private lands are respectful to the landowners, there are always a few thoughtless individuals who spoil the relationship for all. The actions of the heedless minority, perhaps even more than the actual increase in numbers of sportsmen, have forced more and more landowners to post their land every year. This study was undertaken in 1962 to evaluate the over-all posting situation in New York State as a basis for finding ways to overcome some of these problems. It became the first project of the newly established Cooperative Wildlife Research Unit at Cornell University.

HISTORY

The posting problem is not new, and numerous studies of landowner-sportman relations have been made, not only in this State but elsewhere. None of them, however, included all the aspects of the present study, but they did provide background and guidance for

this investigation. Those which the writer believed most valuable may be reviewed briefly.

Posting Studies Outside New York

Morrow (1950) reported on a survey in Missouri which compared two methods of sampling. In the first method, questionnaires were mailed to every agricultural extension agent and conservation agent and to a representative farmer and a representative sportsman in each county. In addition, a survey was conducted on a random sample basis in which 9,000 individuals known to be either farmers or sportsmen were mailed a questionnaire similar to the one the non-random group received. The results of 4,845 replies from the random survey showed very close agreement with the non-random survey. The data showed that posting had increased in about 80 per cent of Missouri's counties since 1946 and that it restricted hunting and fishing activities in 72 per cent of the counties. However, farmers in 90 per cent of the counties allowed hunting and fishing if permission was requested. Acreage figures were not given.

The Ohio Division of Wildlife used another approach to measure the extent of posting (Whitesell, 1952). Personnel were specifically employed to conduct personal interviews with landowners. Samples included only farm populations living in the open country zones. The "open zones" consisted of all the area lying outside incorporated places, villages and unincorporated places with a population density of at least 100 persons per square mile. The number of farmers selected for the sample and the methods used in selecting them were not reported. The survey revealed that, although Ohio law prohibited trespass without permission, 27 per cent of the farm acreage was posted against public hunting. Other results indicated that 61.8 per cent of Ohio's farmland (both posted and unposted) was available to hunters if they obtained permission. That much of the unposted land was not available for hunting caused considerable friction between farmers and sportsmen.

In reporting a study in Whitman County in the State of Washington, Slocum and Empey (1954) stressed the vital role played by the farmer in maintaining upland game populations on private land. The survey was conducted through personal interviews with 190 farmers, or approximately 10 per cent of all farm operators in the county who operated farms larger than 10 acres. The farms were selected at random by taking every tenth name from the files of the county office of the Production and Marketing Administration. Although the study was not basically concerned with gathering quantitative information on posting, some data were collected. It was found that 7 per cent

of the farmers (representing 135,000 acres) restricted hunting completely, while 11 per cent (representing 149,000 acres) allowed hunting by permission, and 82 per cent (representing 1,070,000 acres) did not post their land at all.

A study in the southern portion of the Province of Ontario (McCrimmon, 1959) was designed primarily to learn the attitudes of farm families toward the sportsmen wishing to fish and hunt on their land. The study area included 27 counties comprising 12.5 million acres, or almost 6 per cent of the land mass of Ontario, in which 75 per cent of the rural population lived. The procedure included taking a random sample of farm families fully dependent on agriculture for their livelihood. A total of 380, or about 0.5 per cent of the farmers, were selected. Results showed that 18 per cent of the farmers posted against trespass and that, of these, 30 per cent did not allow entry while the remaining 70 per cent usually permitted entry. Of the remaining 82 per cent of the sample, who did not post against trespass, 39 per cent were against trespass without permission and 61 per cent were not concerned over controlling entry on their lands.

In a very comprehensive study, Larson (1959) surveyed the entire State of Massachusetts, using a 2 per cent sample of landowners owning hunting land. The sample was obtained by running 10 north-south strip cruise lines evenly spaced across the state from east to west. The necessary names were selected by taking the name of every landowner who owned 10 or more acres of land from every tenth page of the tax records of those cities and towns which the cruise lines touched. A sample population of 1,165 landowners resulted, 69 per cent of whom responded to a mailed questionnaire requesting information pertaining to such items as the number of acres posted or unposted and their attitude toward sportsmen. Analysis of the data received showed that, of the total state acreage, 20 per cent was posted, 55 per cent was unposted, and the remaining 25 per cent was land on which hunting was not possible, e.g., urban areas or public land. Another important finding was that 59 per cent of the landowners who posted their land would allow hunting and fishing if permission were asked.

In Pennsylvania a study was conducted of both posting and non-posting landowners in three counties (Barclay, 1965). It was found that 90 per cent of the landowners who posted would allow hunting on request.

Posting Studies in New York

A survey made by game protectors in 1939 in Essex County (Kerst,

1960) indicated that approximately 20 per cent of the total area of more than one million acres were posted against hunting and fishing and related outdoor activities either as private lands or as private parks and reserves. The methods and procedures used in making the survey were not discussed.

The 1946 convention of the New York State Conservation Council expressed considerable concern with the posted land problem on Long Island. Consequently, the conservation commissioner instructed personnel of the Division of Fish and Game to undertake a posted land survey there with special emphasis on upland game range. In July and August of 1947, game protectors mapped all areas closed or open to public hunting on U.S.G.S. quadrangle maps. In summarizing the data, Bromley (1947) reported that 72.43 per cent of the total land area in Suffolk County and 95.15 per cent of that in Nassau County were closed to public hunting.

The first statewide survey was undertaken during the winter of 1954 when game protectors were required to drive over all roads in their respective districts and interview personally all landowners who had posted signs on their property. The three main questions asked were: (1) the number of acres posted, (2) the number of acres unposted, and (3) did the landowner allow hunting by permission on his posted land. While the data were not published, the author was able to discuss some of the findings with two of the game protectors who participated in both the 1954 survey and in the present study. One, Mr. Harold Lienemann (personal communication), who carried out both surveys in St. Lawrence County, reported a decline in the number of acres posted in the town of Hammond (one of the 100 towns sampled in 1963). The decline may have resulted in part from the State's purchase of additional hunting lands in this area after 1954, some of which had been previously posted by former private owners. The other, Mr. Doyle Glover (personal communication) who participated in both surveys in Cortland County, reported that from his observations the posting situation remained about the same during the interim.

Following enactment of the Fish and Wildlife Management Act in 1957, a number of local surveys were made. Information from some of these in central New York was supplied by Mr. Ben Bradley of the Conservation Department (personal communication). A survey made in June 1957 of the Butternut Creek area in Onondaga County revealed that, of 86 landowners (on 11,585 acres) interviewed, 46 (on 6,760 acres), or 58.35 per cent, posted their land. In a similar survey in the towns of Elbridge, Marcellus, Otisco and Skaneateles in Onondaga County, it was found that, of the 66 owners who responded to the

questionnaire, 11 posted their land. Figures as to the number of acres or percentage of area posted were not available.

In Broome County, the results of the Conservation Department's survey in 1954 showed that 18.5 per cent of the county was posted. Wilkins (1959) reported 18 per cent to have been posted in 1959, 18.5 per cent in 1960, and 16.7 per cent in 1961. These figures indicated little change between 1954 and 1961.

Role of the Fish and Wildlife Management Act

The so-called "landowner-sportsman problem" has arisen from dissatisfaction among sportsmen with the degree of land posting against public hunting and fishing and, conversely, among private landowners with illegal trespass and damage to fences, livestock and occasionally even human life itself. The problem is basically a result of the ever-increasing human population and, in turn, competition for a place to conduct various recreational pursuits, in particular hunting and fishing. Hunting for farm game (pheasants and rabbits) in particular gives rise to heavy concentrations of hunters close to places of habitation. The most productive farm game environment is principally found on the better agricultural lands, most of which are in private ownership. Sportsmen want to hunt and fish freely over the most productive areas, while the landowner must cope with their behavior. The result, unfortunately, is oftentimes an unpleasant one, with the private landowner bearing the brunt of the unpleasantness. It poses a problem that must be overcome if free public hunting is to be maintained in the American tradition on the private lands of New York State.

The need for positive action was recognized by the Joint Legislative Committee on Revision of the Conservation Law. A review of experience in other states revealed that, with few exceptions, the landowner had not been taken into a workable partnership (Swanson, 1957). Accordingly, it was felt that some sort of cooperative agreement between the landowner, the sportsman and the State should be devised. To implement this, the Fish and Wildlife Management Act was enacted in 1957. The Committee's report for 1956–57 (Joint Legislative Committee on Revision of the Conservation Law, 1957) contains an excellent description of this legislation and its development. Its basic objectives were (1) to obtain, on privately owned lands of the State, practices of wildlife management which would conserve and develop the wildlife resources of the State and (2) to improve access to privately owned lands for recreational purposes by the people of the State (Cheatum, 1957).

The State board, created pursuant to the Act, placed consideration of the posting problem high on its agenda. Early in 1962 its Planning Committee recommended that the Department of Conservation at Cornell University be invited to conduct a posting study in cooperation with the State Conservation Department. It further recommended that the study be divided into two phases: Phase I to measure quantitatively the extent and type of posting; Phase II to measure the motivations for posting and landowner reactions to possible means of solving the problem. The project reported here was the result.

Evolution of Laws Relating to Posting in New York

Skiff (1951), in his discussion of the historical background of the Conservation Law, stated that the foundation of colonial law in America was derived from the common law of England. In England, prior to the Magna Charta, the ownership of wildlife resources was vested in the King as an individual. Under the Magna Charta, ownership was transferred to the Crown in its sovereign, rather than individual, capacity.

In America, ownership of wildlife was inherited first by the colonies and then by the original thirteen states. In New York, ownership of fish and wildlife is still vested in the people of the State with the Conservation Department, through existing laws, being responsible for managing these resources for the benefit of all the people. The philosophy of wildlife ownership established by the colonists laid the groundwork for the present concept of public hunting and provided for the individual states having jurisdiction within their boundaries.

To begin with, there was little conflict between the interests of landowners and the activities of hunters and fishermen. There was an abundance of wild lands, and those who hunted and fished were chiefly local people. Some restrictions were instituted in the vicinity of settlements. The first known enactment of this sort was passed on October 9, 1652 by the New Amsterdam Colony (O'Callaghan, 1868). It read as follows:

> Ordinance of the Director and Council of New Netherland against firing at Partridges or other Game within the limits of New Amsterdam.
>
> Whereas, many guns are daily discharged and fired at Partridges and other game within the jurisdiction of this city New Amsterdam and in the vicinity of the Fort, by which firing People or Cattle might perhaps be struck and injured, against which practice complaints have already been made, Therefore the Honorable Director General and Council, in order to prevent accidents, expressly forbid and interdict all persons henceforward firing within the jurisdiction of this city or about the Fort, with any guns at Partridges or other Game that may by chance

fly within the city, on pain of forfeiting the gun and a fine at the discretion of the Judge, to be applied one-third to the Poor, one-third to the Church, and one-third to the Officer.

Gradually the situation changed as the population expanded and the numbers of sportsmen increased. To an ever greater degree, hunting and fishing were done on lands being farmed or relatively close to rural habitations. To protect their property, landowners resorted to prohibiting trespass. At first this was done under the civil law, but later provision was made in the fish and game law for posting against hunting, trapping and fishing.

The first trespass law pertaining directly to hunting and fishing was contained in Chapter 186 of the Laws of 1860, Sections 12 and 13 of which read as follows:

Section 12—Trespass—against hunting and fishing

Any person who shall enter lands or premises of any resident of this state, with any fire-arms or other implements, for the purposes of hunting or fishing contrary to the provisions of this act, shall be deemed guilty of a trespass, and shall upon conviction before any justice of the peace, forfeit and pay for the use of the poor of the county in which such conviction shall be had, the sum of five dollars, in addition to the provisions of this act.

Section 13—Trespass (without consent of owner)

Any person who shall at any time enter upon any field in which cultivated trees, plants, vines or crops are growing, for the purpose of hunting without the consent of the owner or occupant therefore being previously had and obtained shall be deemed guilty of trespass, and upon conviction thereof, shall pay fine of ten dollars for the use of the poor of the county in which the conviction is had.

Section 19 of Chapter 474 of the Laws of 1862 included the first reference to the public notice, and Section 20 explicitly warned against shooting near dwellings. They read as follows:

Section 19

Any person trespassing on any lands for the purpose of taking fish from a private pond, stream, or spring after public notice on the part of the owner or occupant thereof, or if said lands not to so trespass, shall be deemed guilty of trespass, and in addition to any damages recoverable by law shall be liable to the owner, lessee, or occupant in a penalty of $25.00 for each offense.

Section 20—Against shooting

Any person who shall at any time enter upon the lawn, garden, orchard or pleasure grounds immediately surrounding a dwelling house, with any fire arm for the purpose of shooting contrary to the provisions of this act, or shall shoot any bird or animal thereon, shall be deemed guilty of trespass and in addition to the damages shall be liable to a penalty of $10.00.

In Chapter 909 of the Laws of 1869, the acts of shooting, hunting and fishing were treated collectively, and the manner of giving public notice forbidding trespass was described for the first time. Historically, the latter is the basis for the present-day poster.

Section 13—Trespassing upon lands for shooting and fishing when prohibited—after public notice

Any person trespassing upon lands owned or occupied by another for the purpose of shooting, hunting or fishing thereon, after public notice by such owner or occupant as provided in the following section shall be deemed guilty of trespass, and shall be liable to such owner or occupant in exemplary damage for each offense, not exceeding twenty-five dollars, and shall also be liable to the owner or occupant for the value of the game killed or taken.

Section 14—Owners of lands to publish notice and put up sign boards forbidding trespass

The notice referred to in the preceding section shall be given by publishing an advertisement particularly describing such land and forbidding such trespass in the official papers of the county, or a paper published in the town where such lands are situated for the period of 3 weeks and in the months of April or May in each year by signboards at least 1 foot square to be put up and maintained in not less than two conspicuous places on the premises; such notices to be signed by or have appended thereto the name of the owner or occupant.

Since that time, various other changes have been made. Chapter 721 of the Laws of 1871 provided that possession of implements of shooting or fishing should be presumptive evidence of the purpose of the trespass, and it also fixed a penalty for tearing down or defacing a posting sign. Chapter 411 of the Laws of 1877 required that signs be placed in at least two conspicuous places on the lot lines of each 100 acres of the property being posted; this was reduced to "every 50 acres" by Chapter 534 of the Laws of 1879 and to "every 25 acres" by Chapter 318 of the Laws of 1912. Chapter 796 of the Laws of 1930 provided that the word "posted" in conspicuous lettering would be sufficient as a notice, and Chapter 642 of the Laws of 1939 required that, in such case, the lettering must cover an area of not less than 80 square inches. Chapter 359 of the Laws of 1936 reduced the minimum size of the notice or signboard to 11 inches square.

Chapter 534 of the Laws of 1879 also provided for the first time for establishing private parks for propagating or protecting fish and wildlife. It required that signs warning against trespass be placed not more than 40 rods apart along the entire boundary, except that if the boundary had a 6-foot-high fence the signs might be not more than one-half mile apart. The 40-rod minimum interval was later applied to all posting and is still in effect. Chapter 319 of the Laws of 1896, however, provided that waters in which fish were stocked by the State with consent of the owner after April 17, 1896 might not be laid out as such a park. Chapter 466 of the Laws of 1921 required that illegible or destroyed signs on private parks be replaced once a year during July, August or September, and March was added by Chapter 49 of the Laws of 1924.

Special provisions with respect to fox farms were added by Chapter 242 of the Laws of 1928.

As stated in the Fish and Game Law prior to 1939, the effect of posting on private parks was to forbid hunting and fishing or entering thereon with an implement for that purpose, but on other private lands it was to forbid all trespass. Chapter 642 of the Laws of 1939 eliminated this discrepancy and consolidated the provisions concerning the effect of notices in a separate section of the Law (§362), which applied to all private lands and included the following paragraph.

> But nothing contained in the foregoing section shall obligate the conservation department to enforce such provisions except when the trespass committed consists of hunting, fishing or trapping or disturbing fish and game.

The recodified Fish and Game Law that became effective July 1, 1956 made it unlawful for a person hunting, trapping or fishing without permission on the lands of another, whether posted or not, to fail to leave upon request of the owner, lessee or lawful occupant. It also provided for revocation of license privileges in case of conviction.

At the same time it was also stipulated that, whether his lands are posted or not, a landowner owes no duty to keep the premises safe for entry or use by others for hunting, trapping, fishing or dog training, provided no fee is charged. It was felt that this would lessen the amount of posting being done because the landowner feared he would be liable for injuries suffered on his premises by sportsmen permitted to use them. This provision has since been incorporated in the General Obligations Law.

The general relationship of the Fish and Wildlife Management Act to the posting problem and to the present study has been described. Another feature of the Act was to authorize the Department to establish "restricted areas" on lands under cooperation agreement. The effect is to prohibit hunting, for example, in safety zones around a farmer's house and barns, current work areas and special use sites while permitting it elsewhere.

This is a brief summary of the evolution of the laws relating to posting in New York, with particular reference to the Fish and Game Law. In that law at present, provisions governing posting generally are contained in Sections 365 to 369, while Section 176 covers restricted areas under the Fish and Wildlife Management Act. Former Section 370 "No duty to keep premises safe for hunters, trappers or fishermen or for the acts of such persons" is now Section 9–103 of the General Obligations Law.

SUBDIVISIONS OF THE STATE

In designing a statewide survey of this nature it was essential to consider the various geographical regions of the State which had

relevance for the study. The State has been divided into subdivisions for many different purposes. The ones most applicable to the work of this project were the agricultural regions, the game range regions and the administrative regions of the Division of Fish and Game

Agricultural Regions

Following are brief descriptions of the agricultural regions (Figure 1), as modified from Conklin and Hardy (1963).

Central Plain This relatively prosperous agricultural region has a favorable topography and climate. Its fertile, high-lime soils are adequate for commercial farms which make up 35 per cent of the area. These farms average 110 crop acres; however, there is a general trend toward more dairying, and many farms are being enlarged.

Erie-Ontario Lake Plain This area has a level topography, a long growing season, temperature variations moderated by Lakes Erie and Ontario, and a wide variety of soils. Fruit and vegetable production predominates with cash crops and dairying being secondary. Rural residences and part-time farms are common in poor soil areas. Commercial farms average 85 crop acres. Urban penetration will continue in this region.

Figure 1. Distribution of agricultural regions (after Conklin and Hardy, 1963) in relation to the administrative regions of the Division of Fish and Game.

Western Plateau Commercial cropland constitutes 21 per cent of this region and averages 80 acres per farm. Dairy farming predominates on the hills, while vegetable farms are situated on the better valley soils. Both dairy and vegetable farms will remain strong in this area. Urban pressures are limited.

Plateau County Commercial cropland constitutes 17 per cent of this region and averages 85 acres per farm. Hill farms have definite limitations because of topography, transportation, soil and length of the growing season. Valley farms generally have good topography with acid soils which are well drained and productive. Operations on the valley farms will become more intensive partly as a result of land shortage due to urban penetration.

Delaware Hills This region is characterized by steep hillsides and narrow valleys with a cool, wet climate suitable for hay and pasture crops. Commercial cropland constitutes 21 per cent of the region and averages 70 acres per farm. Natural conditions somewhat limit opportunities for further intensification and consolidation of farms, but agriculture will remain the dominant element in the economy for many years.

Escarpment Country Commercial cropland constitutes 30 per cent of this region and averages 90 acres per farm. Hillside farms with high-lime, well drained soils and climatic conditions that are good for dairy farming are characteristic. Urban penetration is of minor importance.

Oneida Plain This is predominantly a dairy region with favorable topography, good precipitation, and a relatively long growing season. Commercial cropland constitutes 15 per cent of this region and averages 70 crop acres per farm. The farms are not well developed; however, off-farm job opportunities are good. For these reasons, agriculturalists predict a decline in farm activity.

Black River-Mohawk Commercial cropland constitutes 31 per cent of this region and averages 90 acres per farm. A cool, high-moisture climate provides good conditions for a predominantly sound dairy economy. Urban penetration is increasing in the Mohawk Valley.

North Country Although agriculturally responsive soils are intermingled with unresponsive ones, this region is characterized by a topography and climate favorable to dairy farming. Commercial cropland constitutes 23 per cent of the region and averages 85 acres per farm. There is little urban pressure.

Mohawk-Hudson Plain Where farming exists, this region has a favorable topography with a medium-long growing season and

medium rainfall. The soils are poorly drained and most of the farms are small. Commercial cropland constitutes 15 per cent of the region and averages 80 acres per farm. Dairying predominates. However, fruit, vegetable and poultry farms are also found to some degree. With good off-farm job opportunities plus a strong urban penetration, a continued decline in farming is expected.

Catskill Foothills Shallow, stony soils predominate, which prohibit the development of modern cropland farming. Commercial cropland constitutes 6 per cent of the region and averages 55 acres per farm. Poultry production is the chief agricultural activity. Commercial recreation and other non-farm land uses are expanding.

Hudson Basin Commercial cropland constitutes 21 per cent of this region and averages 75 acres per farm. A long growing season, good rainfall, well drained soils, and a generally flat or rolling topography sustains a variety of agriculture, including fruit, vegetable and dairy farms. Because of its proximity to New York City, urban influences will continue to be strong.

Hudson Hills Commercial cropland constitutes 20 per cent of the region and averages 80 acres per farm. Dairying predominates and is concentrated where topography is level to moderately hilly. The growing season is adequate, while rainfall and the soils are generally favorable. Poor lands are out of agricultural use, especially in the southern part where urban influences are strong. More intensified farming is predicted.

Lower Hudson-Long Island The most highly capitalized, specialized and technically advanced farms in the State are found in this region. However, only 4 per cent of the region is in commercial cropland. Vegetable and potato farms average 65 crop acres. Most of the region is urban, and urban pressure is increasing.

Adirondacks, Catskills, Tug Hill and Allegany Hills These four regions are considered non-agricultural. Although they represent 27 per cent of the area of the State, they sustain only 2 per cent of the commercial farms. Agriculture either has never been developed or has long been abandoned because of limitations of climate, topography or soils. Large areas are publicly owned.

Game Range Regions

The following descriptions of the game regions are modified from Smith (1954). Their limits are illustrated in Figure 2.

Adirondack Mountains The Adirondack region is characterized by mountainous topography and contains numerous streams, lakes and ponds. Nearly the entire area is occupied by forests. Where

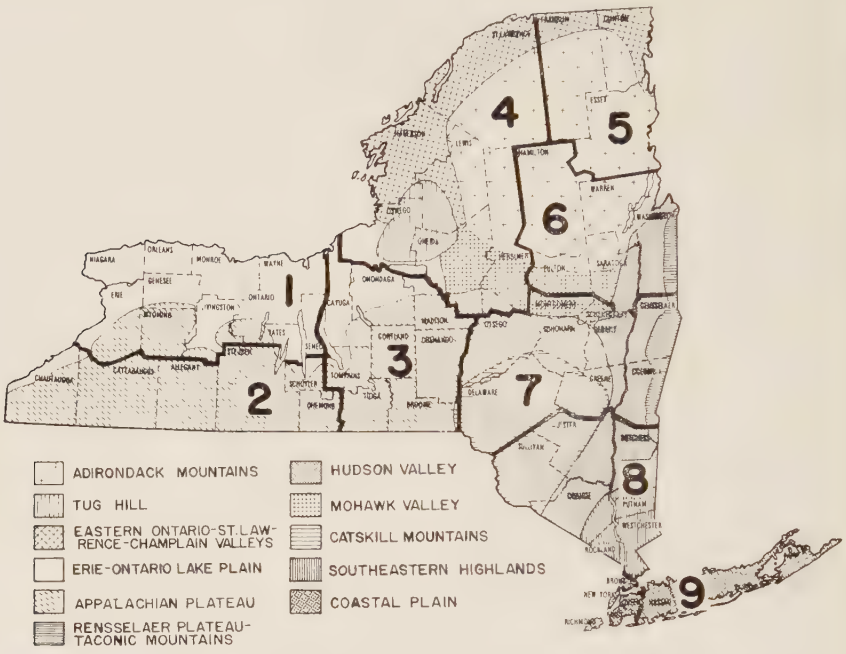

Figure 2. Distribution of game range regions (after Smith, 1954) in relation to the administrative regions of the Division of Fish and Game.

elevations are below 1,500 feet the forest consists of beech, yellow birch, sugar maple, hemlock and paper birch. Balsam fir and red spruce are interspersed among these species in some areas. On the lowlands east of the higher mountains, white pine is important. The principal game species are white-tailed deer, black bear, varying hare and ruffed grouse.

Eastern Ontario-St. Lawrence-Champlain Valleys This region has a relatively flat topography. The predominant forest cover is beech, sugar maple, basswood, hemlock and the northern birches. Red, white and bur oaks are found along the two lakes and the St. Lawrence River, and extensive arborvitae swamps occur in limestone areas. Much of the area has been cleared for agriculture. The principal game species are Hungarian partridge, ring-necked pheasant, ruffed grouse, cottontail rabbit, gray squirrel, varying hare, white-tailed deer and waterfowl.

Erie-Ontario Lake Plain This region is quite flat near Lake Erie and Lake Ontario, but it becomes rolling and is dissected by broad valleys in its southern part. A large proportion of the area has been cleared for agriculture, but there are remnants of the original forest which consisted principally of deciduous trees, particularly

beech, sugar maple, basswood, black birch, white ash and yellow poplar or tulip, with mixtures of hickories and white, black, red, bur and swamp white oaks on the drier sites. There are many cattail marshes, some of large size. Farm game species predominate, notably the ring-necked pheasant and cottontail rabbit, while gray squirrels inhabit the oak-hickory woodlands. The white-tailed deer, which has extended its range north to Lake Ontario since 1930, affords some hunting opportunity but also causes considerable agricultural damage. Waterfowl are important in the water areas, and in the marshes muskrats are trapped extensively.

Appalachian Plateau The Appalachian Plateau is an ancient peneplain dissected by numerous streams. Elevations are mostly over 1,000 feet, resulting in a predominance of northern hardwood species such as beech, black birch, hemlock and sugar maple. Also present are some of the central hardwood species such as hickory, black cherry and red oak. White pine can be found on sites with well drained soils. Extensive areas, that were once farmed, have reverted to secondgrowth woodland. Forest game species predominate, including white-tailed deer, ruffed grouse and gray squirrel, but the ring-necked pheasant and cottontail rabbit are found in the lower valleys. Varying hares have been successfully reintroduced and are replacing cottontails in a number of localities where a revision to forest cover has occurred. Wild turkeys have also been reestablished in several areas.

Hudson Valley This region supports oak-hickory forests which give way to northern species near its Adirondack boundary. Much farm land is present. The range supports fairly good populations of ring-necked pheasant, cottontail rabbit and gray squirrel, as well as limited numbers of ruffed grouse and deer. Waterfowl are found chiefly during migration.

Rensselaer Plateau-Taconic Mountains In contrast to the warmer and lower elevations of the Hudson Valley, this region is relatively cooler and has elevations from 1,000 to 2,500 feet. The higher elevations support a more northern type of forest association consisting of red spruce, balsam fir, yellow birch and paper birch, along with beech, sugar maple, hemlock and white pine. It supports the usual forest game species, such as white-tailed deer, black bear, varying hare and ruffed grouse. On the periphery of the region gray squirrels and cottontail rabbits are also present.

Mohawk Valley This comprises a generally narrow valley flanked by hilly terrain. The forest cover is mainly a beech-maple-hemlock association in the cooler areas and northern slopes, while oaks and hickories are found on warmer sites and south-facing slopes.

Although most of the area is under cultivation, it supports only small populations of pheasants, primarily on bottom lands where grains are grown. Cottontail rabbits and white-tailed deer populations are also small.

Catskill Mountains This region is characterized by a ridge-and-valley terrain. The original forest was a beech-sugar maple-yellow birch-hemlock-white pine association with red spruce, balsam fir and paper birch at the higher elevations. Extensive destruction of hemlock for tanbark and clear cutting for acid wood have left vast areas now occupied by beech, sugar maple and black cherry. The typical forest game species such as white-tailed deer, black bear, varying hare and ruffed grouse are found. Cottontails occur in the few cultivated areas.

Southeastern Highlands This is a rough, rocky area that supports a forest principally made up of a variety of oaks with interspersions of beech, maples, hemlock and tulip poplar. At present gray squirrel, ruffed grouse, cottontail rabbit and white-tailed deer are found where the habitat is suitable.

Coastal Plain This generally level area has been taken over by industrial and residential development to an extent that game range is now largely limited to the eastern part (i.e., Suffolk County). The hills along Long Island Sound are principally oak forest, while residual oak-pitch pine stands occur in the center of the Island. Southward more southern species, such as sweet gum, pin oak, American holly and persimmon, also are found. The principal game species are cottontail rabbit, ring-necked pheasant, quail and waterfowl; the latter are important in the coastal waters throughout the region. White-tailed deer are numerous enough to be a nuisance to agricultural interests, but hunting for them is not permitted because of local sentiment.

Administrative Regions of the Division of Fish and Game

The Fish and Wildlife Management Act enacted in 1957 required the Conservation Commissioner to establish not to exceed 15 fish and wildlife management districts for administering the program, such districts to consist of one or more counties each and collectively to include all counties not wholly within a city. At first, 13 districts were created, but the number was later reduced to nine which are now known as regions. Field operations of the Division of Fish and Game are carried on through personnel from a regional headquarters in each. Since these regions follow county lines, they do not coincide with the agricultural or game regions recognized. Their relationship is shown in Figures 1 and 2.

DISTRIBUTION OF HUMAN POPULATION

According to the United States Bureau of Census (1961b) New York State's population was 16,782,301, of which 14,331,925, or 85.4 per cent, were classified as urban and the remaining 2,450,379, or 14.6 per cent, as rural. The urban population was further divided into: (1) "central city" with 9,356,289 inhabitants and (2) "other urban territory" with 1,975,636. The principal centers of

Figure 3. Principal population centers in relation to the administrative regions of the Division of Fish and Game.

TABLE 1. THE SEVEN PRIMARY URBANIZED AREAS OF NEW YORK STATE*

Area	Population
New York City	10,694,633
Buffalo	1,306,957
Albany — Schenectady — Troy	657,503
Rochester	586,387
Syracuse	563,781
Utica — Rome	330,771
Binghamton	212,661
Total	14,352,693

* After United States Bureau of Census (1961).

population are shown in Figure 3 together with the boundaries of the administrative regions of the Division of Fish and Game. There are seven primary urbanized areas (Table 1) that include not only a large city or cities but also, in many instances, contiguous towns having populations of 150 or more per square mile.

PHASE I

The objective of this phase of the project was to measure quantitatively the extent and type of posting being done. It was not considered feasible to attempt to record all posted lands throughout the State. Therefore, a sampling procedure was developed.

Methods and Procedures

It was decided to organize the sampling procedure according to the administrative regions of the Division of Fish and Game and to assign selected conservation officers to do the field work. These officers would gather the required information by direct observation supplemented by data from other sources such as town and county clerks, tax assessors and county highway departments.

One of the initial tasks was to decide what the sampling unit should be and the method of selecting the samples. After considering a number of suggestions and after consultation with Dr. Howard Conklin of the Agricultural Economics Department at Cornell University, it was decided that each administrative region would comprise a stratum and that the town would be the sampling unit. It was first contemplated that a complete survey would be made of all improved roads within the sample town, but this was later modified to include unimproved roads as well.

Exactly which towns to include in the "universe" (i.e., the total group) from which the sample towns would be drawn was next considered. It was decided that the universe should be all towns in the State with a population density of less than 150 persons per square mile. Such data were obtained from the Department of Agricultural Economics at Cornel University, and all the towns in this category were listed according to their respective administrative regions. Because of the uniqueness of Region 9 (Nassau and Suffolk Counties on Long Island) it was decided that it would be considered separately, using different procedures, and therefore would not be included in the initial survey.

In the eight administrative regious considered there were 764 towns with a population density of less than 150 per square mile. This constituted the sample universe. It was decided that 100 of these, randomly distributed, would be a representative sample. On the

premise that the number of conservation officers in each reflected the combined hunting pressure and land area in the region, it was also decided to apportion the 100-town sample among the regions according to the proportion of the officer force stationed in each (Table 2). The sample towns were then chosen using a table of

Table 2. Regional Distribution of Towns in Sample Universe and of Those in Sample Selected for Study*

Region	Number of counties	Total number of towns	Towns in sample universe§	Towns in sample studied	Number of conservation officers
1	11	162	117	16	28
2	6	140	130	11	19
3	8	127	105	12	20
4	6	139	131	19	33
5	3	51	50	6	11
6	5	66	58	10	18
7	9	130	115	12	21
8	7	104	58	14	23
Total	55	919	764	100	173

* Region 9 omitted in this phase of study.
§ Towns with population density of less than 150 per square mile.

random numbers. This method gave each town an equal chance of being selected. The towns comprising the sample are listed by region in Table 3 and their geographical distribution is shown in Figure 4.

After the sampling unit was decided upon, the next step was to devise a suitable field survey form on which to record the information desired. Preliminary field studies were made by the author during the summer of 1962 in the towns of Waverly in Franklin County (Adirondacks), Dryden in Tompkins County (central New York) and Washington in Dutchess County (Hudson Valley). These towns represented different geographical areas and were surveyed completely so that the author might experience most of the problems that the conservation officers would encounter during the actual survey the following winter and spring. From this work a field survey form was developed that was pre-tested in September by a party composed of the author, the leader of the cooperative wildlife research unit at Cornell, a conservation officer from Region 3 and two graduate students. The pre-tests were conducted in the towns of Groton in Tompkins County and Cuyler in Cortland County. The form finally adopted is shown in Figure 5.

Table 3. Towns Selected for Study in Each Region

County	Town	County	Town
	Region 1		
Erie	Concord Marilla	Ontario	Phelps
Genesee	Elba Pavilion	Orleans	Murray Yates
Livingston	Groveland Lima	Wayne	Macedon
Monroe	Parma Riga	Wyoming	Orangeville Pike
Niagara	Royalton	Yates	Benton
	Region 2		
Allegany	Amity Grove Rushford	Chemung	Catlin
Cattaraugus	Franklinville New Albion	Schuyler	Orange
Chautauqua	Harmony Portland	Steuben	Hornellsville Troupsburg
	Region 3		
Broome	Nanticoke Windsor	Cortland	Cuyler
Cayuga	Aurelius Venice Victory	Madison	Eaton
Chenango	Coventry McDonough	Onondaga	Pompey
		Tioga	Nichols
		Tompkins	Caroline
	Region 4		
Herkimer	Manheim Schuyler Stark	Oswego	Boylston Mexico West Monroe
Jefferson	Antwerp Orleans Rodman	St. Lawrence	Clare Edwards Hammond
Lewis	Denmark High Market		Louisville Oswegatchie Potsdam
Oneida	Ava Vienna		

TABLE 3 (*continued*)

Region 5			
Clinton	Beekmantown Clinton	Franklin	Bangor Altamont Duane
Essex	Essex		
Region 6			
Fulton	Mayfield Stratford	Warren	Bolton Thurman
Hamilton	Morehouse	Washington	Putnam Hampton
Saratoga	Day Greenfield Saratoga		
Region 7			
Columbia	Chatham Claverack	Montgomery	Charleston Palatine
Delaware	Andes Deposit Kortright	Otsego	Burlington
		Rensselaer	Hoosick
Greene	Durham Lexington	Schoharie	Richmondville
Region 8			
Dutchess	East Fishkill Pleasant Valley Union Vale	Sullivan	Delaware Highland Neversink Thompson
Orange	Chester Deerpark Hamptonburg Minisink	Ulster	Plattekill Marbletown
Putnam	Patterson		

To facilitate filing and correlating the data, a coding system was devised for the regions, counties and towns making up the sample. Also, the field survey form was so designed that this and other pertinent information could be transferred to IBM cards directly without being transcribed prior to the card-punching operation. In this way an individual IBM card could be prepared for each parcel of posted land recorded.

For each town in the sample, the conservation officer most familiar with the area was assigned to make the field survey. In doing

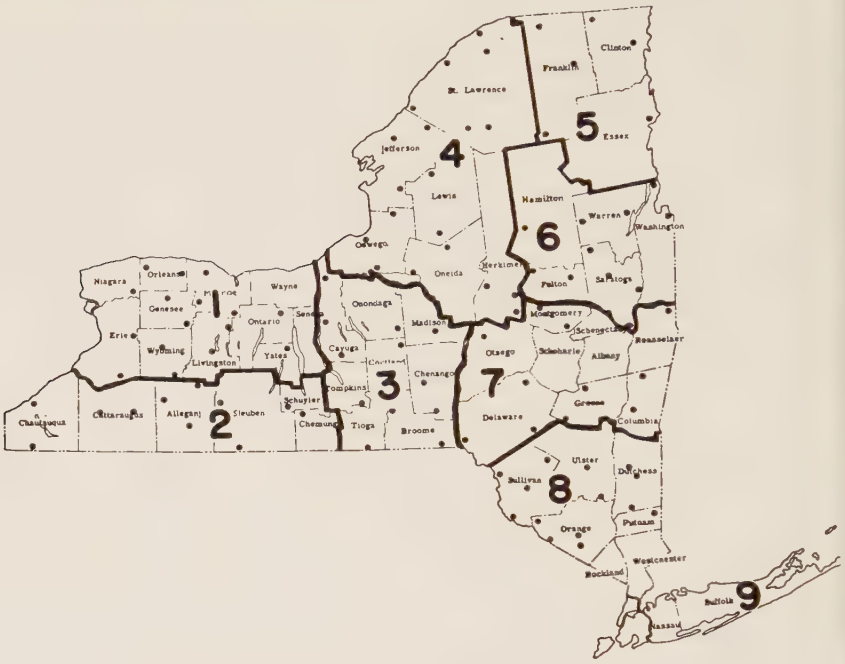

Figure 4. Distribution of the 100 sample towns in relation to the administrative regions of the Division of Fish and Game.

this, he traversed all public roads in the town and marked on a map, by drawing a line perpendicular to the road at each corner, the location of each parcel of posted land he encountered. The appropriate U. S. Geological Survey guadrangle maps were used for this purpose. Wherever possible, the larger-scale 7.5 minute (1:24,000) maps were obtained in order to facilitate plotting posted properties and any additional data that might be pertinent to the survey. County highway maps were also used for orientation with respect to changes in roads that had occurred. The officers were also requested to indicate on the map all roads traveled by drawing a line along those completed. This accomplished two things: (1) it acted as a check for the officer himself, to make certain that all roads were covered, and (2) it indicated locations of built-up areas that were not included in the survey. Thus the data obtained represent only posting along roads, which constitute the normal access points that the majority of sportsmen would use.

For each posted parcel a separate field survey form was completed and numbered the same as its map location. A four-quarter diagram was included on the form sheet to represent the corresponding parts of the U.S.G.S. maps used, and the location of each parcel was plotted

NEW YORK STATE POSTING STUDY
TOWNSHIP SURVEY SHEET

1-3 Parcel No
4-6 Town
Investigator . . . . . Date 7-Region
USGS Quad. 8-9 County
Location
USGS Coord. (indicate scale of Quad. used) 7.5 min. 1:24,000 ☐ or 15 min. 1:62,500 ☐
10-15 Total size of parcel . . . . acres
Landowner . . . . Mailing Address . . . .
Is landowner an absentee? Yes 16-1 ☐ No 16-2 ☐

PARTY POSTING:

Actual owner		Second Party		Does second party have a lease?	
Yes	17-1 ☐	Rod & Gun Club (open)	18-1 ☐	Yes	19-1 ☐
No	17-2 ☐	Private group (closed)	18-2 ☐	No	19-2 ☐
		Private individual	18-3 ☐		
		Other (explain)	18-4 ☐		

Name and address of second party

POSTING:

Legal		If illegal why? (check all that apply)			
Yes	20-1 ☐	Sign not 80 sq. inches	21-1 ☐	Over 40 rods between posters	25-1 ☐
No	20-2 ☐	No name	22-1 ☐	Posters not placed around the entire parcel	26-1 ☐
		No address	23-1 ☐	Other (explain on back of sheet)	27-1 ☐
		Not at least one poster between each corner	24-1 ☐		

THE POSTER: (additional information)

Type of sign		Material used if temporary		Material used if permanent			
Temporary	28-1 ☐	Paper	29-1 ☐	Metal	29-4 ☐	Plastic	29-7 ☐
Permanent	28-2 ☐	Cardboard	29-2 ☐	Cloth	29-5 ☐	Other (explain)	29-8 ☐
		Other (explain)	29-3 ☐	Wood	29-6 ☐		

Condition of Poster		Message on Poster	
Poor	30-1 ☐	Type I	31-1 ☐
Fair (partly legible)	30-2 ☐	Type II	31-2 ☐
Good	30-3 ☐	Type III	31-3 ☐

Is owners name press printed? Yes 32-1 ☐, No 32-2 ☐
Please write any exceptional message on the back of the sheet 33-1

AVERAGE DISTANCE BETWEEN SIGNS: 34-36 . . . . feet

KIND OF ROAD OR ROADS POSTER IS ADJACENT TO AND LINEAR DISTANCE SIGNS EXTEND ALONG EACH: Record in tenths and miles. (Note if road is posted on both sides double figure)

Dirt 37-39 . . . . Paved 43-45
Gravel 40-42 . . . . Total 46-49

LAND USES:

	Primary (one)		Secondary			Primary (one)		Secondary	
Cattle	50-1	☐	50-2	☐	Forest products	56-1	☐	56-2	☐
Dairy	51-1	☐	51-2	☐	Abandoned land	57-1	☐	57-2	☐
Grain & Corn	52-1	☐	52-2	☐	Estate	58-1	☐	58-2	☐
Poultry	53-1	☐	53-2	☐	Shooting preserve	59-1	☐	59-2	☐
Veg. crops	54-1	☐	54-2	☐	Other (explain)	60-1	☐	60-2	☐
Fruit crops	55-1	☐	55-2	☐	Residence only	61-1	☐		

IS LAND USED FOR FULL TIME FARMING: Yes 62-1 ☐ No 62-2 ☐
Additional observations and comments (on back of sheet please) 63-1 ☐

Figure 5. Form used for recording data on Phase I of the survey.

on this by a pencil dot. In addition to data obtained by observation at the site, the other information called for was obtained from various sources. When an owner's name was not available from field observation, personal knowledge or local contacts, the tax assessor was usually able to supply it. Total acreages for individual parcels were obtained from the town clerks. Although this phase of the study was designed as a non-interview type of survey, contact with a landowner was not ruled out if it would expedite gathering needed information.

Each participating conservation officer was furnished the maps, forms, etc. he would need together with detailed instructions with respect to the individual items of information to be recorded. Also, meetings were held with the officers to explain and discuss the procedures to be followed. The field data were taken during the winter and spring of 1962–63.

Findings

Of the 31,728,640 acres (including inland waters) in New York State, 26,715,442 acres, or 84.1 per cent, lie in the 764 towns having a population density of less than 150 per square mile that constituted the universe for this study. Of the remaining 5,013,198 acres, 1,198,080 acres are occupied by the five counties that comprise New York City, namely, Bronx, Kings, New York, Queens and Richmond and the two counties making up Region 9, namely, Nassau and Suffolk. The other 3,815,118 acres represent the 155 towns having a population density of more than 150 per square mile. In most cases the latter are contiguous with or close to the large cities and surrounding urban areas where there is little or no hunting and fishing opportunity.

The total acreage in the 100 sample towns was 3,230,694 or 12.1 per cent of the 26,715,442 acres in the universe. Of this sample, 2,783,316 acres, or 86.2 per cent, were private lands which, in turn, represented approximately 10 per cent of the universe. It should be noted that the posting data for the sample are to be projected to the area comprising the universe and not to the State as a whole.

Field survey forms were completed for 4,176 parcels of posted land in the sample area. The data for the various items of information were tabulated by town. They are summarized for each region and for the total sample in Tables 4 to 14. The percentages for the total sample were based on weighted averages according to the formula given by Simpson *et al.* (1960, p. 69). By using this method, the frequencies within each region were considered, which resulted in more representative values.

Degree of Posting

The 4,176 parcels comprised 713,972 acres (Table 4). The average parcel size was lowest in Region 1 and highest in Region 5. The high value in Region 5 was the result of large holdings of forest products industries. The relationship of posted area to total area is shown in Table 5. In general, there was less posting the farther an area was from a major urban area.

TABLE 4. NUMBER, TOTAL ACREAGE AND AVERAGE SIZE OF POSTED PARCELS RECORDED

Region	Number of Parcels	Acreage	
		Total	Average
1	1,158	130,584	113
2	285	45,305	159
3	385	45,965	119
4	466	135,387	290
5	62	43,571	702
6	148	34,988	236
7	494	89,555	181
8	1,178	188,617	160
Total	4,176	713,972	213*

* A weighted average according to formula of Simpson *et al.* (1960, p. 69).

TABLE 5. DEGREE OF PRIVATE POSTING IN THE SAMPLE TOWNS AND PROPORTION DONE BY SECOND-PARTY OWNERS

Region	area in sample towns (acres)	Total area* (acres)	Private land			
			Area posted		Area posted by second-party owners	
			Acres	Per cent§	Acres	Per cent†
1	418,751	401,909	130,584	32	16,033	12
2	300,324	274,083	45,305	17	3,045	7
3	338,603	310,026	45,965	15	7,466	16
4	653,366	578,791	135,387	23	93,164	69
5	261,334	206,605	43,571	21	17,556	40
6	441,388	289,010	34,988	12	1,212	3
7	422,218	357,611	89,555	25	7,749	9
8	394,710	365,281	188,617	52	77,941	41
Total	3,230,694	2,783,316	713,972	26	224,166	31‡

* Less built-up tracts and State, Federal, county and municipal areas.
§ Of total area.
† Of private land.
‡ A weighted average according to formula of Simpson *et al.* (1960, p. 69).

The degree of posting was greatest in Region 8 which is closest to metropolitan New York. Of the 11 sample towns, 10 had 50 per cent or more of the private land posted. Many of these 10 towns are contiguous with or within a few miles of densely populated areas, while others are located in the Catskill region where the rate of second-party and absentee posting is high and where there are numerous summer resorts whose lands were posted. In two towns bordering New Jersey, the high rate of posting probably reflected

hunting pressure from the heavily populated northern part of that state.

The second highest degree of posting occurred in Region 1 which also ranged second in population concentration. Of the 16 sample towns only one had more than 50 per cent of the private land posted, although from 40 to 49 per cent was posted in three towns and from 30 to 39 per cent in four towns. The two towns having the most posted land (Marilla, 83 per cent; Royalton, 44 per cent) are contiguous with the Buffalo urban area. The towns with relatively low degrees of posting were for the most part in the southern part of the region where the density of population was generally lower. Hunting pressure seemed to be relatively evenly distributed throughout the sample towns.

In the other regions there was less correlation between the size of the human population and the degree of posting. One of the most important reasons for this is the location of the centers of population in relation to the regional boundaries. For example, Syracuse is at the northern edge of Region 3 and probably had little influence on posting in the central part of the region. On the other hand, the town of Deposit had the highest proportion of posted lands in Region 7 although it is far from the urban area of Albany and Schenectady; it is, however, close to the Binghamton urban area in Region 3. In Region 4, sample towns near Utica and Rome had relatively less posting than those near Syracuse. That Syracuse is adjacent to Region 4 may explain, in part, the low rate of posting in Region 3.

Type of Ownership of Posted Lands

The intimate knowledge held by the conservation officers of their individual patrol areas greatly facilitated gathering information. The items to be recorded are shown in Figure 5. Whether the person responsible for posting was a permanent resident or an absentee owner was noted. An absentee owner was considered to be an actual owner, but one who did not reside on the property for at least several months of the year. Where posting was done by a second-party, the type of lease (verbal or formal) was noted. The data are summarized in Table 6 in terms of percentage.

Actual Owner Individual owners who in every respect were responsible for posting their own land were designated as actual owners. Absentee owners also were included in this group. On a statewide basis, 3,393 owners, or 81 per cent, posted their own land. Region 2 had the greatest proportion (97 per cent), followed closely by Region 6 with 93 per cent, while Region 5 was lowest with 58

TABLE 6. PERCENTAGE OF POSTING ACCORDING TO TYPE OF OWNERSHIP AND PERCENTAGE OF SECOND-PARTY OWNERS HAVING FORMAL LEASES

Item	Region								
	1	2	3	4	5	6	7	8	Mean
Type of ownership									
Actual owner									
Resident	87	87	74	53	27	65	62	43	65
Absentee	5	10	11	17	31	28	29	23	16
Sub-total	92	97	85	70	58	93	91	66	81
Second-party owner									
Private group	2	<1	5	27	23	1	4	15	9
Private individual	5	2	5	3	15	2	5	6	5
Gun club	<1	<1	4	<1	0	<1	1	11	4
Other	1	<1	1	0	5	3	<1	2	1
Sub-total	8	3	15	30	43	7	10	34	19
Total	100	100	100	100	101	100	101	100	100
Second-party owners									
Formal lease	3	2	7	3	19	1	3	15	7

per cent. As a whole, actual owners accounted for 68 per cent of the total acreage posted.

ABSENTEE OWNER Absentee owners accounted for 16 per cent of the 4,176 parcels recorded. Although it was not always possible to determine the specific reasons for absentee ownership, it was evident that the majority of such owners were particularly interested in using their land for hunting purposes. Parcels not used for hunting were generally occupied during the summer (including summer camps) or on occasional weekends throughout the year.

Region 5 had the highest proportion of absentee owners (31 per cent). The town of Duane in Franklin County had 11 of the 19 absentee owners recorded for this region. Of these 11 parcels, seven were used for hunting while the remaining four owners used their land for reforestation projects. Regions 7 and 6 followed Region 5 closely with 29 and 28 per cent, respectively.

Although Region 8 ranked fourth with 23 per cent, it had the greatest number of posted parcels in the absentee-owner category with 275. Four towns in particular had high numbers of absentee owners, i.e., Neversink with 78, Thompson with 37, Highland with 35 and Deerpark with 35. The first three are in Sullivan County, while

Deerpark is in Orange County. The town of Highland had numerous owners from New Jersey.

Second-party Owner Individuals or groups other than the actual owner, who posted land, were designated second-party owners. Four types of such owners were recognized.

1. Gun club (open). This type comprised gun clubs whose membership was not limited to a specific group or number. A typical example was a club which permitted additional hunters to join for the privilege of hunting on gun club land. In most instances these hunters were from distant places so that "membership" was actually only temporary.
2. Private group (closed). A gun club having a restricted membership and not allowing temporary membership was considered to be a closed group.
3. Private individual. A neighbor or friend, or in some instances even a stranger, who had obtained permission to post a parcel of land for his own specific use was designated as a "private individual".
4. Other. Miscellaneous types of second-party posting were placed under this heading. Examples were instances in which the owner had some relative or friend post the property or where the State Conservation Department leased land from a private individual.

Second-party posting applied to 19 per cent of all the parcels in the sample. Regions 5, 8 and 4 with 43, 34 and 30 per cent, respectively, had the highest rates.

Regions 4 and 5 include some of the State's more sparsely settled wilderness-type areas, in addition to many farms which are going out of business or being abandoned. Towns such as Duane in Franklin County (Region 5) and Clare in St. Lawrence County (Region 4) were typical of the type of land where second-party posting was most prevalent. Notable characteristics were: (1) being a long distance from large metropolitan areas; (2) having a great deal of wooded or forested land; (3) being generally sparsely settled; and (4) being situated in the poorer agricultural land classes where many farms had gone out of production.

Of the four categories of second-party posting, the private group or closed type of organization predominated with a statewide average of 9 per cent. Region 4 had the highest proportion (27 per cent), followed by Region 5 with 23 per cent. Some towns in Region 4, such as Ava, Clare and Edwards, could be classified as "gun club" towns since 90 per cent or more of the posted acreage was controlled by sportsmen's groups.

In Region 8, the relatively high proportion of second-party posting was probably due to its proximity to large cities or rapidly expanding urban areas where both hunting pressure and general posting were high. Such circumstances cause many hunters from the cities and high population centers to join a gun club, establish a new club or hunt elsewhere.

On the basis of acreage (Table 5), Region 4 ranked first with 69 per cent, followed by Regions 8 and 5 with 41 and 40 per cent, respectively. Although the total number of parcels under second-party posting constituted only 19 per cent of all posted parcels, they represented 31 per cent of the total area of private land posted.

Only 7 per cent of all second-party owners had formal (or written) leases (Table 6). However, Regions 5 and 8, which had the highest proportions of second-party posting, also had more than 50 per cent of all the formal leases granted.

VARIATIONS IN POSTING ENCOUNTERED

Wide variations were encountered both in the manner in which property was posted and in the nature of the posters used.

LEGAL AND ILLEGAL POSTING It was first planned to inspect all the boundaries of each parcel. However, it was decided to make observations on the nature of the posting only from roadside approaches that would commonly be used by hunters and fishermen, although conditions on the "back forty" would remain unknown.

TABLE 7. PERCENTAGE OF PARCELS LEGALLY POSTED TOGETHER WITH THAT OF DIFFERENT TYPES OF VIOLATION*

Item	Region								Total
	1	2	3	4	5	6	7	8	
Parcels legally posted	48	61	43	69	52	41	54	73	58
Parcels not legally posted									
Message less than 80 square inches	1	2	2	3	0	14	2	1	2
No name	27	22	26	11	5	24	18	4	17
No address	36	26	41	15	6	45	29	12	26
Not at least one poster between corners	8	18	12	5	11	12	15	2	8
Over 40 rods between posters	2	8	9	2	2	7	7	3	4

* All figures are percentages of the entire sample; those for most regions total more than 100 because several violations could occur on the same parcel.

This procedure also precluded any previous knowledge that the conservation officer may have had about the parcel. It was also decided to reduce the great variety of violations that might be found to five categories (Table 7) that would be most likely to be observed by sportsmen approaching from the highway.

The data obtained revealed that 58 per cent of the parcels were legally posted. The proportion was highest in Region 8 and lowest in Region 6. Except in Region 6, very few owners violated the

requirement that the message occupy an area of at least 80 square inches. Absence of names and addresses on posters was the most frequent violation, the proportion being substantial except in Regions 4, 5 and 8. Failures to place at least one poster between corners were fewer, and instances where signs were more than 40 rods apart were relatively insignificant.

The Poster Information concerning the poster itself represented another attempt to determine the intent and quality of the posting done. One of the original aims of the survey was to differentiate between landowners who posted temporarily (seasonally) and those who posted permanently (year around). After discussion with the conservation officers, it was decided that if signs were up all year and were legible at the time of the survey, they would be assumed to be up permanently and would be so recorded. That some landowners might not allow hunting in some seasons but allow it in others could not be ascertained during this phase of the work.

It was found impractical to attempt to compare various materials in relation to temporary or permanent use of the signs. The type of material used, however, was recorded (Table 8). Although the field survey form listed "paper" and "cardboard" separately, most such signs were actually printed on a heavy cardboard-like material which could be interpreted either way depending on the individual observer's

Table 8. Frequency (in per cent) of Posters Made of Various Materials and Relative Condition of Posters*

Item	Region								Total
	1	2	3	4	5	6	7	8	
Material									
Paper	56	36	23	23	3	34	29	14	32
Cardboard	37	48	68	18	35	30	55	36	40
Metal	5	5	4	29	24	11	4	5	8
Cloth	0	2	2	19	24	10	3	16	8
Wood	1	2	3	3	0	7	1	1	2
Plastic	<1	4	0	1	0	0	0	1	1
Other	<1	1	0	1	6	1	0	0	1
Total	100	98	100	94	92	93	92	73	92
Condition									
Poor	7	13	10	10	11	18	5	2	7
Fair	39	31	32	43	29	23	32	11	29
Good	53	54	55	44	58	56	61	47	52
Total	99	98	97	97	98	97	98	60	88

* Where total is less than 100 per cent, the difference represents parcels for which these data were not recorded.

preference. Therefore, data for the two were combined. This was by far the most popular material, and 72 per cent of the signs were made of it. It was used least in Regions 4 and 5 where metal signs were most frequent. Use of cloth tended to parallel that of metal, while wood and plastic were used to a lesser degree.

In Region 4, in the town of Edwards there were 77 of 97 parcels, and in the town of Clare 23 of 43 parcels, posted with metal signs. In these two towns 93 and 89 per cent, respectively, of the private lands were under second-party posting, which helps to explain the high use of metal signs. In the Town of Ava, also in Region 4, cloth signs were used on 42 of 44 parcels. This town, too, had a high percentage of second-party posting (92 per cent). Also, such owners often used plastic signs, especially in the Hudson Valley (Region 8), Region 1 and some sections of Region 4. Apparently rod and gun clubs and similar groups tended to purchase more expensive material with longer lasting qualities.

A factor that gave some insight into the quality of posting was the condition of the poster. Three categories were listed pertaining primarily to the physical condition and legibility of the poster, namely:

poor—indicating that the message was not legible and/or torn
fair —indicating that the message was only partly legible but in fair condition
good—indicating that the message was entirely legible and in good condition

Although this information was not noted on all the field survey sheets in each region, sufficient data were obtained for comparison (Table 8). Poster condition was generally high. In most regions, more than 85 per cent of the signs recorded were in good or fair condition.

Another aspect of the poster was the message on it. Experience during the preliminary field work indicated that the variety of messages was almost limitless. Because primary interest was in the actual intent of the person posting, records were grouped according to three basic types of message, namely:

Type I—indicating that no trespassing of any kind was allowed
Type II—indicating that limited trespass was permitted, i.e., individuals might fish only, hunt only, or hunt a specific animal such as woodchuck
Type III—indicating that the hunter was welcome provided permission (written or verbal) was obtained

The data are summarized in Table 9.

The Type I message (essentially prohibiting trespassing of any kind) was by far the most frequently encountered. The others were used very little. This was true in all regions. The prevalence of the Type I sign may be interpreted in one of two ways: either this

Table 9. Percentage of Posters Bearing Different Types of Message and of Posters Having Owner's Name Press Printed*

Item	Region								Total
	1	2	3	4	5	6	7	8	
Message									
Type I	96	93	87	91	98	82	82	91	91
Type II	<1	0	1	<1	0	3	1	1	<1
Type III	1	1	0	<1	0	1	<1	10	3
Total	98	94	88	93	98	86	84	102	95
Owner's name press printed	8	13	19	49	82	40	38	63	35

* Where total is less than 100 per cent, the difference represents parcels for which these data were not recorded.

particular message expresses the true intent of the landowner; or, because commercially purchased posting signs, unless specially ordered, are printed with a message of this nature, few landowners bother to change it.

Whether or not the owner's name was press printed was recorded to give additional information in the quality of posting (Table 9). Regions 5 and 8 where this was most frequent also ranked highest in the amount of second-party posting, indicating that groups such as hunting clubs often go to the expense of having signs printed to their own specifications.

Location of Posters For each parcel, the average distance between posters and the kind of road they were adjacent to, including the distance they extended along the road, were recorded. Distances were usually measured according to the speedometer of the observer's

Table 10. Average Distance Between Posters

Region	Number of parcels	Distance between signs in feet	
		Total	Average
1	1,158	256,879	222
2	285	72,483	254
3	385	105,304	273
4	466	110,635	237
5	62	9,585	154
6	148	24,218	163
7	494	133,132	269
8	1,178	171,155	145
Total	4,176	883,391	222*

* A weighted average according to formula of Simpson *et al.* (1960, p. 69).

TABLE 11. NUMBER AND PROPORTION OF ROAD MILES POSTED

Region	Road miles in sample	Road miles posted				
		Type of road			Total	
		Dirt	Gravel	Paved	Number	Per cent
	3,377	103	114	542	759	22
	1,496	77	48	79	204	14
	2,168	144	67	104	315	15
	3,155	33	75	175	283	9
	721	10	18	85	113	16
	1,224	19	28	47	94	8
	2,049	106	101	119	326	16
	2,297	164	134	633	931	41
Total	16,487	656	585	1,785	3,025	18*

* A weighted average according to formula of Simpson *et al.* (1960, p. 69).

TABLE 12. RELATIONSHIP OF PROPORTION OF PRIVATE LAND POSTED TO PROPORTION OF ROAD MILES POSTED IN SAMPLE

Region	Private land posted		Road miles posted	
	Per cent	Rank	Per cent	Rank
	32	2	22	2
	17	6	14	5
	15	7	15	4
	23	4	9	6
	21	5	16	3
	12	8	8	7
	25	3	16	3
	52	1	41	1

car and computed on the basis of 0.1 mile = 528 feet. Because the survey was restricted to the access points which hunters commonly use (i.e., along roads which a vehicle could travel), fire and hiking trails were not included. If a road ran through posted property, the mileage was doubled to account for both sides. Three kinds of roads were listed on the survey form: (1) dirt, (2) gravel, and (3) paved (all types). If snow covered the road, then the personal knowledge of the observer supplemented by the U.S.G.S. or county map usually served to determine what kind of road was involved. In many instances little differentiation could be made between dirt and gravel roads, and the type recorded reflected the personal view of the observer.

The data for the distance between signs and for the extent of posting along the different types of road are summarized in Tables 10, 11 and 12. The average distance between signs was 222 feet, and it was less than 300 feet in all regions. The maximum distance permitted by the Fish and Game Law is 40 rods or 660 feet. Region 8, which adjoins the metropolitan New York area and had the greatest proportion of private acreage posted (Table 5), had the highest proportion of

Table 13. Percentage of Posted Parcels According to Kind and Degree of Land Use and Owner's Type of Occupancy

Use	Degree*	1	2	3	4	5	6	7	8	Mean
Land use										
Cattle	P	3.88	10.17	4.62	10.51	4.83	5.40	5.26	1.95	4.80
	S	5.26	1.75	3.37	1.28	..	1.35	2.06	4.07	3.47
Dairy	P	22.19	45.61	33.76	23.81	1.61	6.75	30.56	17.82	23.94
	S	2.93	0.35	2.33	2.36	..	..	0.40	1.52	1.74
Grain	P	25.30	4.21	7.79	2.36	1.61	2.02	1.82	0.93	8.85
	S	19.34	36.14	15.84	2.57	..	0.67	5.46	3.22	11.15
Poultry	P	0.43	0.35	0.51	0.21	3.22	..	0.20	1.18	0.62
	S	0.25	..	0.77	..	..	..	0.60	0.59	0.38
Vegetable crops	P	5.44	..	1.03	1.50	..	..	..	0.25	1.84
	S	2.50	1.05	1.29	0.21	..	1.35	0.80	0.50	1.19
Fruit	P	3.79	2.10	0.25	0.64	..	2.70	1.41	1.69	2.03
	S	1.55	0.35	0.51	0.21	..	..	1.01	0.59	0.81
Forest	P	3.36	13.68	5.19	18.66	29.03	22.29	4.04	12.22	9.57
	S	1.81	11.92	17.14	11.15	12.90	20.27	17.40	18.59	12.35
Abandoned	P	20.98	10.17	14.02	22.31	3.22	19.59	18.82	24.78	20.25
	S	10.44	19.64	10.12	9.22	4.83	14.86	17.81	28.35	16.89
Estate	P	0.43	0.35	1.81	1.28	1.61	4.05	4.65	4.92	2.55
	S	..	1.05	..	2.36	3.22	2.70	0.40	1.18	0.86
Hunting and/or fishing preserve	P	0.25	1.05	0.51	8.15	12.90	4.05	0.40	1.95	2.03
	S	0.77	0.35	4.15	13.51	12.90	0.67	0.60	4.32	3.63
Other	P	3.97	2.45	4.62	1.28	4.83	4.05	2.42	13.75	6.21
	S	0.86	5.61	0.51	1.28	4.83	2.70	1.41	0.33	1.24
Occupancy										
Resident only§		7.25	2.10	19.74	9.01	6.45	13.51	20.64	11.12	11.13
Full-time farmer		59.32	56.14	47.27	36.90	16.12	17.56	37.24	25.63	41.25

* "P" and "S" represent primary and secondary uses, respectively, for parcels where more than one use was listed.
§ See text.

road miles posted (11 per cent). Region 1, which includes Buffalo and Rochester, ranked second. Where a relatively low percentage of the road mileage was posted, as in Regions 4 and 6, three factors seem to have been largely responsible, i.e., large tracts of wilderness-type land having relatively short road frontage, relatively few roads existing, and a low proportion of posted land.

Land Use

The type of land use was recorded for each posted parcel according to 12 categories (Figure 5). If a parcel had more than one important use, both primary and secondary uses were noted. The "residence only" category pertained to small parcels such as building lots or a few acres used for strictly residential purposes. The data are summarized in Table 13.

Among the primary uses, dairy farming ranked first (23.94 per cent) followed by abandoned land (20.25 per cent). The position of dairy farming is correlated with its being the chief agricultural activity in the State according to the 1959 census of agriculture (United States Bureau of Census, 1961a) as shown in Table 14. Of interest is the fact that poultry farming, although ranking second in number of farms and fourth in acreage according to the same census, was lowest with respect to land use on the posted area. The principal secondary uses were abandoned land, forest and grain raising.

The relative frequency of the different land uses varied among

Table 14. Relative Extent of Different Types of Agriculture in New York State and Degree of Posting Associated with Each

Type of agriculture	Total towns in State*			Parcels posted (per cent)§
	Per cent	Acres		
		Number	Per cent	
Dairy	69	9,085,231	79	24
Grain	3	335,385	3	9
Livestock	5	530,689	5	5
Fruit and nut	5	301,554	3	2
Vegetable	3	194,460	2	2
Poultry	7	327,484	3	<1
General farming†	4	457,297	4	§§
Other field crops	2	166,628	1	§§
Miscellaneous‡	3	125,976	1	§§

* After United States Bureau of Census (1961).
§ Proportion of sample in present study.
† Farms deriving income from three or more commodities.
‡ Greenhouses, nurseries, etc.
§§ Not identified in present study.

the regions. Although dairying predominated generally, it was a minor activity in Regions 5 and 6 where forest and abandoned land were the chief uses. In Region 1 grain raising was the principal use. Hunting and/or fishing preserves were a major use in Regions 4 and 5, but little of the posted land elsewhere was devoted to them.

Whether or not a particular parcel was used for full-time farming had to be ascertained either from previous knowledge of the conservation officer or from the general physical appearance of the property. If evidence of cultivation, stock present, farm machinery and number of buildings indicated that the parcel was a full-time operation, it was so designated. Region 1 ranked highest in this respect, and Regions 5 and 6 lowest.

PHASE II

The objective of this phase of the project was to learn the motives for posting. Whereas Phase I was a non-interview type of survey that involved simply inspecting the posted lands, Phase II consisted of personally interviewing the owners. The same universe of towns was used in both cases.

Methods and Procedures

A questionnaire was developed for recording the information desired. Not only did it pertain to the reasons and motivation for posting, but it also included other items such as how long the land had been owned, when it was first posted and why, whether it was patrolled and whether strangers were allowed to hunt with permission. The form finally adopted, after pre-testing, is shown in Figure 6. It was found during the early interviews, however, that some questions were not significant or applicable to the results of the study, and these were often omitted thereafter. Instead of asking the questions specifically as listed, informal discussions were frequently employed when they were found to be more effective. Insofar as possible, answers to the questions were recorded directly during the interview.

One of the initial problems was to decide on a procedure that would give valid results once the questionnaires were completed. From the information gathered during Phase I it was apparent that four distinct kinds of landowner were involved.

1. Absentee owner. (as defined under Phase I)
2. Second-party owner. (as defined under Phase I)
3. Farmer. Actual owners who derived their livelihood from the land were classed as farmers.
4. Non-farmer or other rural resident. This category pertained to rural residents who did not derive their livelihood from the land. In some instances, where the owner leased a portion of his land to another individual or had a small woodlot, garden or the like, he was still recorded here.

NEW YORK STATE POSTING STUDY
Field Interview Questionnaire

Interview No. 1-3 _____ 7-9 TOWN _____
Parcel No. 4-6 _____ 10 REGION _____
Date _____ 11-12 COUNTY _____

Interviewer _____

I. INTRODUCTION

A brief explanation of the study, the reason for it, who is supporting it etc.

II. LANDOWNER DATA

Name _____ Who was interviewed
Mr. 13 ____, Mrs. 14 ____, Son 15 ____
Daughter 16 ____, Other 17 ____

The actual landowner is:
Private individual 18 ____
Sportsman Club 19 ____
Private Group 20 ____

Total size of parcel 21 - 25 _____ acres

Address _____ Phone No. _____

Absentee owner Yes 26-1 _____, No 26-2 _____

III. OCCUPATION

Are you a full time farmer? Yes 27-1 ____, No 27-2 ____

Part-time farmer? Yes 28-1 ____, No 28-2 ____ 29-30% of income ____

Non-farm occupation _____

IV. LAND USE

(obtain data from field survey sheet, circle if same.)

Do you lease any of your land for farming, or purposes other than hunting?

Yes 31-1 ____, No 31-2 ____ If yes: 32-35 _____ acres

	Primary	Secondary		Primary	Secondary
attle	36-1 ____	36-2 ____	For Hunting	45-1 ____	45-2 ____
airy	37-1 ____	37-2 ____	Abandoned land	46-1 ____	46-2 ____
rain & Corn	38-1 ____	38-2 ____	Estate	47-1 ____	47-2 ____
omestic fowl	39-1 ____	39-2 ____	Shooting preserve	48-1 ____	48-2 ____
eg. crops	40-1 ____	40-2 ____	Fishing preserve	49-1 ____	49-2 ____
ruit crops	41-1 ____	41-2 ____	Nature preserve	50-1 ____	50-2 ____
orest products	42-1 ____	42-2 ____	Camp	51-1 ____	51-2 ____
asture	43-1 ____	43-2 ____	Resort	52-1 ____	52-2 ____
orage crops			Residence	53-1 ____	53-2 ____
			Other	54-1 ____	54-2 ____

V. HUNTING & FISHING OPPORTUNITIES

How long have you owned this land? 55-56 _____ years

Are hunting and/or fishing opportunities available on your land?

	Hunting		Fishing
57-1 ____	YES	58-1 ____	
57-2 ____	NO	58-2 ____	

Do you or members of your immediate family

	Hunt?		Fish?
59-1 ____	YES	60-1 ____	
59-2 ____	NO	60-2 ____	

If yes:
on your land 61 ____
neighbors land 62 ____
beyond county 63 ____

Do you allow friends to

Hunt?		Fish
64-1 ____	YES	65-1 ____
64-2 ____	NO	65-2 ____

Do you allow strangers to

HUNT?		FISH?			
				w/permission	w/o permission
66-1 ____	YES	67-1 ____		68-1 ____	68-2 ____
66-2 ____	No	67-2 ____			

Is permission asked by

Hunters?		Fisherman?
69-1 ____	YES	71-1 ____
69-2 ____	NO	71-2 ____
70 ____	By some	72 ____

During what season(s) is your land

Hunted?		Fished?		
Large game	73 ____	Trout	78 ____	
Small game	74 ____	Bass	79 ____	(Deck #2)
Waterfowl	75 ____	Pike	80 ____	Columns 1-12
Vermin	76 ____	Smelt	13 ____	same as before
Other	77 ____	Other	14 ____	

VI FISHING

If fishing is available, what kind:

Farm pond	15 ____	16 (SCS ____)
Stream	17 ____	
Lake	18 ____	
River	19 ____	

What species are present?

Trout	20 ____	Smelt	25 ____
S.m. bass	21 ____	Bullheads	26 ____
L.m. bass	22 ____	Sunfish	27 ____
Yellow perch	23 ____	Other	28 ____
Walleye "pike"	24 ____		

Have you sold fishing rights to the State? Yes 29-1 ____ No 29-2 ____

Are fish stocked? Yes 30-1 ____, No 30-2 ____

If yes by: State 31 ____
Federal 32 ____
Private 33 ____
None 34 ____

VII. INTENT OF POSTING

What is the primary intent of your posting? (i.e. how do you interpret your poster message)?

To prohibit completely 35-1 ____ To regulate or control 35-2 ____

Trespassing (of all kinds) 36 ____
Hunting (of all kinds) 37 ____
Hunting: small game 38 ____
large game 39 ____
bow & arrow 40 ____
vermin 41 ____
Trapping 42 ____
Fishing 43 ____

VIII. REASONS FOR POSTING

Personal reason(s) for posting. (record initial verbal statement)

Hunters		Fishermen	
	Property damage:		
44 ____	shooting livestock		
45 ____	shooting domestic fowl		
46 ____	damage to fences	71 ____	
47 ____	crop damage	72 ____	
48 ____	responsible for fires	73 ____	
49 ____	personal property stolen	74 ____	
50 ____	damage to buildings		
	Nuisance:		
51 ____	protection from large groups	76 ____	
52 ____	drives by large numbers of hunters		
53 ____	gates left open	77 ____	(Deck #3)
54 ____	roads blocked	78 ____	Columns 1-12
55 ____	littering	79 ____	same as before
56 ____	dogs over-run property	80 ____	
	Safety:		
57 ____	personal and family safety		
58 ____	woodchuck hunters		
59 ____	shooting from moving car		
60 ____	shooting from road		
61 ____	shooting near buildings		
62 ____	shooting anything that moves		

Other

63 ____	opposed to hunting / fishing in general	13 ____
64 ____	should hunt or fish on public lands	14 ____
65 ____	hunting / fishing out of season	15 ____
66 ____	belligerence	16 ____
67 ____	intoxicated sportsmen	17 ____
68 ____	desire complete privacy of land	18 ____
69 ____	desire to have game available for friends and relatives only	19 ____
70 ____	past disagreeable experience with sportsmen	20 ____

When was the last time you experienced one of the above

21-22 _____ month(s) ago
23-24 _____ year(s) ago
25 _____ last hunting season

Which of the above item(s) was/were involved? (use code number)

26-27 _____, 28-29 _____, 30-31 _____

Did it happen on your land 32 ____

Your neighbors land 33 ____

You heard about it from somebody who experienced it on their land? 34 _____

Who was at fault:

Hunters 35 ____, Fisherman 36 ____, Both 37 ____

Non-hunters: Campers 38 ____, Picnickers 39 ____

Others 40 (explain) _____

How many years ago was this land open to

Hunting?		Fishing?
40-41 _____	Years ago	42-43 _____

If open previously, why are you posting now?
(record verbal statement and check here 44 _____)

IX. ACTIVITIES OTHER THAN HUNTING

Would you allow activites other than hunting on your land?

Yes _____ 45-1 No _____ 45-2

If Yes, with permission 46-1 _____ without permission 46-2 _____

If yes:

(Those activities permitted are checked)

fishing	47 ____
crow shooting	48 ____
coon trapping	49 ____
vermin shooting	50 ____
Hiking	51 ____
Camping	52 ____
Nature study	53 ____
Aquatic activities (swimming, boating, etc.)	54 ____

X. DURATION OF POSTING: (Permanent/Temporary)

Do you post for the entire year? Yes 55-1 ____ No 55-2 ____

Or temporary for:

bear	56 ____	quail	62 ____
deer	57 ____	waterfowl	63 ____
rabbit	58 ____	other	64 ____
pheasant	59 ____		
grouse	60 ____		
fishing	61 ____		

If your intent is for temporary posting only, do you take down your signs?

Yes 65-1 ____ No 65-2 ____

Would you prefer a permanent type of sign bearing a more specific message, i.e. one which would explain the specific season you wish to post against?

Yes 66-1 ____ No. 66-2 ____

Do you engage in any fish or wildlife habitat improvement on your lands:

Yes ____ No ____

Do you take a reasonable harvest of the fish and wildlife crop on your lands?

XI. THE POSTER

To the best of your knowledge, do your posters meet legal requirements:

Yes 67-1 ____ No 67-2 ____

Are your signs serving their purpose? Yes 68-1 ____ No 68-2 ____

Are your signs damaged? Yes 69-1 ____ No. 69-2 ____

If yes, by Hunters? 70 ____ Fisherman? 71 ____ Both 72 ____

What is the approximate annual cost of posting? 74-76 ____

Poster message: (from survey sheet)

Type I 77-1 ____, Type II 77-2 ____, Type III 77-3 ____,

Type IV 77-4

XII. HOME LOCALE OF SPORTSMAN

If you have had some unfortunate experience(s), have your greatest problems been concerned with:

Hunters?		Fisherman?	
78 ____	from within the county	13 ____	(Deck #4)
79 ____	from nearby villages and cities	14 ____	columns 1-12
80 ____	from large metropolitan areas	15 ____	same as before

(1. Buffalo, 2. Rochester, 3. Syracuse, 4. Utica, 5. Binghamton, 6. Hudson

Others (explain) 16 _____

XIII. LEASING (For hunting & fishing)

Do you lease your land? Formal 17 ____ verbal 18 ____ not leased 19 ____

for: Hunting 20 ____ Fishing 21 ____ both 22 ____

If leased to: Rod & Gun Club 23-1 ____
Private group 23-2 ____
Other 23-3 ____

Why do you prefer to lease your land?

financial	24 ____
someone else patrols land	25 ____
restricts numbers of hunters	26 ____
control surplus game with a minimum of hunters	27 ____
someone else posts land	28 ____

XIV. PATROL OF LAND

Is your land patrolled? Yes 29-1 ___, No 29-2 ____ Why Not? Cost 30-1 ____
Nuisance 30-2____ not needed 30-3 ____

If yes: do you patrol it personally
(or a member of your family)? Yes 31-1 ____, No 31-2 ____

do you hire others? Yes 32-1 ____, No. 32-2 ____

does the lessee handle patrol Yes 33-1 ____, No 32-2 ____

When patrolled: opening day 34 ____ How many days is land patrolled
weekends 35 ____ 37-38 _____ days
daily 36 ____

Seasons during which land is patrolled: Large game 39 ____
Small game 40 ____
Waterfowl 41 ____
Other 42 ____

XV. CO-OPERATIVE GROUPS

Do you belong to a local farmers hunting or fishing coop.? Yes 43-1 ____
No 43-2 ____

FWMA:

Are you aware of the FWMA law, program, etc.? Yes 44-1 ____, No 44-2 ____

Are you familiar with any FWMA Co-op. area? Yes 45-1 ____, No 45-2 ____

Have you considered becoming affiliated with such a FWMA co-operative area:

Yes 46-1 ____, No 46-2 ____.

Would you like to learn more about FWMA Co-op. areas?

Yes 47-1 ____, No. 47-2 ____.

If you are a FWMA co-operator, are you satisfied with the program?
Yes ____, No ____ , If not, why not? (write statement below)

XVI. PERMISSION FOR LAND USE BY SPORTSMEN

Would not grant permission under any circumstances. 48 ____

Would permit hunting and/or fishing under the following conditions:

HUNTING YES	HUNTING NO		FISHING YES	FISHING NO
49-1 ____	49-2 ____	If permission were asked first and property rights were respected?	50-1 ____	50-2 ____
		If Yes; Would you agree to have your sign printed with a statement expressing some form of the following: "Hunters and/or fishermen please ask permission to hunt and/or fish on this land"		
		If No; prefers not to be bothered 52 ____ may not always be at home 53 ____ does not like strangers coming to house 54 ____		
55-1 ____	55-2 ____	If you were reimbursed in some way? e.g. Financial by; State 57 ____ Hunter 58 ____ A subscription to the NYS Conservationist 59 ____	56-1 ____	56-2 ____
		If you had adequate protection, i.e. if you could call a Conservation Officer and get immediate aid?		
60-1 ____	60-2 ____		61-1 ____	61-2 ____
		If numbers of hunters/fishermen were regulated?		
62-1 ____	62-2 ____		63-1 ____	63-2 ____
		If hunting/fishing were prohibited?		
64-1 ____	64-2 ____		65-1 ____	65-2 ____
		If signs were put up by the State?		
66-1 ____	66-2 ____		67-1 ____	67-2 ____
		If safety zone signs were place around the homesite?		
68-1 ____	68-2 ____		69-1 ____	69-1 ____
		If Conservation Officers regularly patrolled your land?		
70-1 ____	70-2 ____		71-1 ____	71-2 ____

XVII. ORGANIZATIONS (membership in) None 72 ____

N.Y.S. Farm Bureau	73 ____	Farmers Union	77 ____
GLF	74 ____	Ext. Service Assoc.	78 ____
Grange	75 ____	SCS District Coop.	79 ____
Sportsman club	76 ____	Other	80 ____

Do you participate in any of the following:

Forest Practice Act ____
ACP Planting program ____
Wildlife Practice Act ____

XVIII. MISCELLANEOUS (Additional comments and observations)

Figure 6. Questionnaire used for recording data on Phase II of the survey.

To give accurate and valid representation for all four types of owner, a 5 per cent sample from each group was randomly chosen for interview by selecting one landowner (from each category) for each 20 in each sample town. Wherever a 5 per cent sample was not possible but the town had representatives in the group, at least one individual was contacted. In instances where there were fractions over 5 per cent, the additional person was contacted. Following this procedure, 34 absentee, 72 second-party, 123 farmer and 132 non-farmer owners in 98 towns[3] were interviewed. They were distributed

TABLE 15. LANDOWNERS INTERVIEWED ACCORDING TO TYPE

Region	Type of landowner				Total
	Farmer	Rural resident	Second-party owner	Absentee owner	
1	42	28	15	4	89
2	14	10	4	1	29
3	14	14	8	3	39
4	18	20	13	4	55
5	2	7	2	..	11
6	3	11	1	4	19
7	14	15	6	4	39
8	16	27	23	14	80
Total	123	132	72	34	361

by region as shown in Table 15 and represented 8.64 per cent of the 4,176 parcel owners recorded during Phase I.

The senior male member of the household comprised 57 per cent of the landowners interviewed; senior women, 31 per cent (Table 16). The remaining interviews were held with sons or daughters of the owners or with others who were very closely associated with the property, such as caretakers, managers or company representatives.

[3]No posted lands were reported in the town of Bangor in Franklin County (Region 5) or in the town of Manheim in Herkimer County (Region 4).

TABLE 16. FAMILY STATUS OF PERSONS INTERVIEWED DURING PHASE II

Person interviewed	Region								Total	
	1	2	3	4	5	6	7	8	Number	Per cent
Man of the house	45	20	18	37	9	8	21	46	204	55
Woman of the house	33	6	17	10	2	9	11	24	112	30
Son	6	1	1	5	..	1	3	4	21	6
Daughter	3	..	..	2	..	..	1	2	8	2
Other	2	2	3	3	..	3	5	6	24	7
Total*	89	29	39	57	11	21	41	82	369	100

* On some occasions more than one person in the household was interviewed; therefore the totals for some regions are higher than the actual number of parcel owners contacted.

Because the male resident was assumed to be most familiar with the posted lands and related situations, this member of the household was always sought out and interviewed whenever possible. However, this was not always possible and in those instances the women were interviewed. It was discovered that they were quite often better informed and more concerned about the trespass problem than the men. It is believed that responses given by women residents were just as valid as those given by male members of the home. In instances where sons, daughters, caretakers or managers were available for interview, they were questioned only when it was obvious that they were thoroughly familiar with the over-all posting and hunting situation.

Although the questionnaire applied to both fishing and hunting activities, incidents pertaining to fishing were almost negligible or of no significance in influencing landowners to post; therefore it was not emphasized in this study.

FINDINGS

Unfavorable experiences with respect to the behavior of sportsmen on their land constituted the underlying cause of posting for most of the landowners interviewed. In the interviews conducted, the nature of these experiences and other aspects of the motivation for posting were discussed, together with the landowner's attitude toward various means of alleviating the problem. However, the unique situation encountered in two towns that did not have any posted lands or any ordinance against hunting warranted special study.

Towns Having No Posted Lands

The two towns, of the 100 in the sample, that had no posting were Bangor in northern Franklin County and Manheim in southern Herkimer County. In both cases, a single individual was primarily responsible.

In the town of Bangor the assistant regional conservation officer of Region 5, Mr. Carl Prue, has taken a personal interest in the many conservation activities of the residents. He has worked with the Boy Scouts and 4H Clubs by teaching basic conservation principles, particularly in the areas of forestry and fish and wildlife management. He has supplemented these activities with instruction in trapping, hunting safety and pheasant raising, especially to the young people. The pheasant propagation activities were especially significant since Bangor lies in one of the better farming areas in that section of the State. He has also lectured on conservation topics and given demonstrations in the local schools and at Grange meetings. The residents of the town respect and trust Mr. Prue. They look upon him not as a conservation officer interested only in making arrests, but as a member of the community who is willing to sacrifice additional time and energy to promote a better conservation philosophy, attitude and appreciation of the natural resources within the town. The lack of posting was a result, yet the landowners felt that law enforcement was effective. Furthermore, the town's pheasant population, augmented by the birds raised and released locally, attracted hunters from surrounding areas. Mr. Prue is now pursuing similar efforts in the town of Chateaugay.

Somewhat different circumstances prevailed in the town of Manheim where the individual responsible was Mr. Harold C. Luther who was not only the town supervisor but also chairman of the district fish and wildlife management board for Region 4. Mr. Luther has achieved a very close and personal relationship with all the landowners in the town. In promoting congenial landowner-sportsmen relations, he has used newspapers in particular to urge sportsmen to respect the rights of owners and to request permission to hunt, and he has made other suggestions for helping to create a more satisfactory rapport between the two. In conjunction with newspaper advertisements, landowners are contacted and verbal agreements to keep their lands open are obtained. When violations are encountered by landowners Mr. Luther looks into them personally.

These efforts have resulted in a town which, although 30 per cent posted four years previously, had no posted lands when this survey was made in 1963. Mr. Luther pointed out that because he is a local resident and knows all the owners, they are more willing to accept

the no-posting idea. He further indicated that the agreements are personal ones and not written or signed—a very important factor in the success of the program.

Reasons for Posting in General

In most cases these were single isolated experiences in which landowners encountered sportsmen displaying poor conduct on their land. In other instances, landowners posted their land initially at the request of other persons (second parties). It is significant that of 223 owners who reported having trouble with hunters (Table 17), in every instance but two the "trouble" occurred on the owner's land.

An effort was made to determine the relative frequency of the various reasons for posting, both major and minor, which landowners had experienced during the course of many hunting seasons and which continued to influence them to keep their signs up every year. Those chosen were believed to include the most common complaints and motivating forces which landowners might have or potentially might give for posting their lands. They were listed on the field interview questionnaire (Figure 6) under four major headings: property damage, nuisance, safety, and other or miscellaneous. The frequency with which these were cited during the interviews is shown in Table 18.

Table 17. Regional Distribution, According to Time and Place of Occurrance, of Owners Who Reported Having Trouble with Hunters

Item	Region								Total	
	1	2	3	4	5	6	7	8	Number	Per cent
Time of trouble										
Little or no trouble at any time	49	9	15	17	3	2	17	26	138	39
Trouble during preceding hunting season	13	12	10	21	2	10	13	32	113	31
Trouble 2 or more years before	27	8	14	17	6	7	9	22	110	30
Place of occurrance										
Owner's land	39	20	24	38	7	17	22	54	221	61
Neighbor's land	1	..	2	..	1	..	..	2	6*	2

* Some owners reported trouble on both their land and neighbor's land.

Table 18. Reasons Most Frequently Cited by Landowners for Posting

Reason	Region								Total	
	1	2	3	4	5	6	7	8	Number	Per cent
Cited by 15 or more of the 361 landowners										
Desire for protection from large groups of hunters	40	14	18	24	4	3	22	46	171	47
Desire for personal and family safety	41	3	13	15	2	7	12	34	127	35
Damage to fences	15	9	9	18	..	6	14	17	88	24
Desire to have game for self and friends	22	6	10	17	2	4	4	13	78	22
Shooting near buildings	21	4	10	6	1	4	9	19	74	20
Shooting near livestock	16	6	8	6	1	3	3	10	53	15
Shooting from road	7	7	5	4	1	4	9	8	45	12
Damage to buildings	6	4	..	4	2	4	3	11	34	9
Damage to crops	13	2	..	4	..	1	1	4	25	7
Property being stolen	2	4	1	3	2	5	..	4	21	6
Belligerence	7	3	2	1	..	2	2	5	22	6
Desire for privacy	3	..	2	4	..	1	3	6	19	5
Disagreeable experience with sportsmen	2	5	..	..	1	1	2	5	16	4
Cited by fewer than 15 of the 361 landowners										
Gates being left open	4	2	..	4	1	1	..	2	14	4
Dogs overrunning property	1	2	3	2	..	2	..	2	12	3
Fire hazard	2	..	..	2	2	2	1	2	11	3
Shooting from moving car	1	..	1	1	1	2	2	2	10	3
Game drives by hunters	..	1	1	2	..	1	2	1	8	2
Shooting at anything that moves	2	2	1	..	..	..	..	4	9	2
Opposition to hunting and fishing	4	..	..	1	..	..	1	1	7	2
Woodchuck hunters	..	..	4	..	..	..	..	..	4	<1
Shooting domestic fowl	1	..	..	..	..	..	..	..	1	<1
Intoxicated sportsmen	..	1	..	..	..	1	..	..	2	<1
Roads being blocked	..	..	..	..	1	..	1	..	2	<1
Hunting and fishing out of season	..	..	..	..	1	..	..	..	1	1

Desire for protection from large groups of hunters was the chief reason given for posting. Of the 361 owners interviewed, 47 per cent expressed concern over this problem. Many felt that by posting their lands they at least could keep the number of hunters down or perhaps even discourage them altogether. Another concern pertaining to "too many hunters" was that the opportunity for the owner to harvest some game for himself was reduced in proportion to the hunting pressure on his land.

Large concentrations of hunters were a problem to an absentee

owner who reported: "This place swarms with hunters. In the last five years a big change has taken place; they won't come in and ask; they'll just go right in and hunt." The same owner stated further: "Hunters just park on your land and say they're going hunting—signs or no signs." He also reported that on other occasions, when he was afield hunting on his land, other hunters would come by and say that they had been granted permission from the owner to hunt. This sort of observation was mentioned by other owners in all regions.

Desire for personal and family safety was the second most important reason for posting and was given by 35 per cent of the owners interviewed. Many correlated large numbers of hunters with safety, not only for themselves and their families but for their livestock and pets as well. One owner explained that his wife couldn't hang out her wash during the first few days of pheasant season for fear of being shot. The wife of this owner stated, "Since the posters have been up, things are a lot better."

Although "shooting near buildings" ranked fifth, it was obvious that "large groups of hunters", "personal and family safety", and "shooting near buildings" all overlapped and were actually integral parts of the same problem. A large concentration of hunters in a particular area can increase the chances for field accidents, particularly when the owner is unaware of the location or number of hunters on his land or when one or more parties are hunting simultaneously on the same parcel. Because of this potential threat, one owner who had seven children indicated that he would not want to encourage hunting on his land for some time to come.

Instances of homes, barns and other buildings being hit by bullets or shot were described by owners on many occasions throughout the State. For example, one rural owner reported hunters shooting at random through a stand of trees close to his home while his children were playing in the vicinity. This particular incident occurred five years ago and the owner has posted ever since.

Another owner cited an incident in which, during deer season, he was sitting in the cab of his pick-up truck and a bullet came through the window, missing him by only a few inches. He now hires his own private game wardens during the hunting season and places them at all road intersections leading to his relatively isolated home site. He further expressed the opinion, echoed by numerous owners in all regions, that, despite the fact that a surplus of deer can be detrimental to his crops, he would rather lose a few bushels of corn than endanger his family or himself.

Fifty-three farmers, 15 per cent of those interviewed, reported losses of livestock through hunting activities. Only one reported that

the hunters involved (in this case a young heifer had been shot accidentally) were willing to pay him for his loss. Some owners also pointed out that while they previously owned Jersey cows they purposely changed to Holsteins because hunters tended to mistake the Jerseys for deer. One very generous owner in Region 2 continued to allow hunters on his land even though he had had cows shot for two consecutive years. The shooting of livestock is one of the important reasons why farmers in particular like to have hunters request permission to hunt in order that they can direct them away from their dairy herds. This is significant when it is realized that the leading agricultural activity in New York State is the dairy industry.

The problem of "damage to fences" ranked third, being cited by 24 per cent of the owners. Fence damage (and cutting), aside from adding to the already time-consuming job of maintenance and repair for the landowner, involves the danger of cattle escaping from their pasture areas. The latter seemed to be the major concern of farmers in particular, as they constituted more than half of the landowners who mentioned it. One dairy farmer expressed the views of many owners in stating that he is liable if his cows escape from the fenced-in areas and cause any damage.

Damage to crops was reported by 25 farmers, of whom 13 were from Region 1. One farmer complained of pheasant hunters tramping down his beans, a crop that he depended upon for most of his income. Another pointed out that because the pheasant season coincided with the bean harvesting season, the problem was perennial. And safety was involved as well as crop destruction. As one farmer put it, "They shot in the tall corn which is bounded by bean crops, endangering the workers in the field."

A large number of owners (farmers in particular) expressed concern over not having an equal chance with other hunters to harvest the game on their own land. Of the landowners interviewed 22 per cent indicated that they "desire a chance to hunt the game for themselves and their own friends". One farmer expressed the feeling typical of many throughout the State: "I feel that I should have a chance at the game, too, since I maintain the land, raise the crops, and quite often, by the time I get my chores completed, all the game has been taken or scared off by the early morning hunters." Other owners simply desired to restrict the hunting for themselves. Some of these owners pointed out that "there's really not that much game around here to begin with."

The 22 owners who reported "belligerence" by sportsmen were essentially complaining about those "sportsmen" who did not want to

listen to the owners' pleas or demands but instead either lied about getting permission to hunt or, in some instances, actually threatened the owner with their weapons. There was even an incident where a handicapped owner was threatened by hunters.

One owner who was quite concerned about littering mentioned not only "the mess that's left behind" but the possibility that a cow stepping on a beer can, for example, could break her foot. However, not all "littering" complaints were lodged against hunters. Some were blamed on teenagers or families having picnics. Only 19, or 5 per cent, of the total people spoken to indicated that they preferred complete privacy on their land.

There were also occasions when landowners responded with a reason or reasons not listed on the questionnaire. The one which occurred most often pertained to persons hunting on private land without requesting permission (Table 19). That less than 1 per cent of the landowners interviewed responded "yes" to the question "Do hunters always ask permission?" signified clearly that very few

TABLE 19. PERCENTAGE OF LANDOWNERS OF DIFFERENT TYPES WHO REPORTED HAVING SPORTSMEN ASK PERMISSION TO HUNT ON THEIR LAND

Region	Type of landowner				Average
	Absentee	Second-party	Non-farmer	Farmer	
Sportsmen ask consistently					
1	0	20	4	2	6
2	0	0	0	7	3
3	0	0	14	21	13
4	0	8	0	0	2
5	0	0	0	0	0
6	0	0	0	0	0
7	25	33	7	0	10
8	0	4	0	0	1
Total					<1
Some sportsmen ask					
1	75	73	86	90	85
2	0	75	70	71	69
3	33	75	71	71	69
4	0	54	80	89	71
5	0	0	71	100	64
6	75	100	73	100	79
7	50	67	80	93	79
8	79	83	85	88	84
Total					78

hunters consistently request permission prior to hunting on private lands. Some owners pointed out that often, after they had given permission to one or two hunters, four or five more would appear from a car not visible to the owner. This type of conduct on the part of some sportsmen is particularly unfortunate, since only 50 per cent of the landowners said they would allow unknown hunters on their land in the first place (see Table 33).

Interval between Acquisition of Land and Initial Posting

An important aspect of the survey was to compare the number of years a parcel had been in the current ownership with the number of years it had been posted. A problem arose when a homesite had been in the family for many years, on some occasions as many as 100 years or more. In such instances the data were based on the number of years the individual (son, daughter, etc.) who was considered the present owner or manager had been in charge. The records are summarized in Table 20. Absentee owners posted within the shortest time, an average

Table 20. Length of Ownership Compared with Number of Years Since Property Was Posted for Different Types of Landowner

Region	Type of landowner				Average
	Absentee	Second-party	Non-farmer	Farmer	
	Years owned				
1	18	26	17	26	22
2	26	3	28	23	20
3	7	32	13	29	20
4	22	40	22	27	28
5	..	50	25	22	32
6	9	27	21	18	19
7	8	45	21	20	24
8	20	21	18	31	23
Average	16	31	21	25	24
	Years posted				
1	18	6	10	16	13
2	18	2	10	6	9
3	8	11	8	10	9
4	12	10	5	10	9
5	..	50	7	8	22
6	9	6	15	5	9
7	8	9	12	8	9
8	10	14	14	13	13
Average	12	14	10	9	12

of 4 years, after acquiring ownership. Non-farm owners were next with an interval of 11 years. Full-time farmers and second-party owners had almost identical intervals of 16 and 17 years, respectively.

Reasons for First-time Posting

Regardless of the type of ownership there were a number of common causes that motivated owners generally to post for the first time. The predominant reasons were: protection—both for self and property, large numbers of hunters, hunters gaining access without requesting permission, and hunter conduct. Although many owners cited poor conduct on the part of local people, most of the complaints were directed toward the "city dweller" (Table 21). Regions 7 and 8

Table 21. Residence of Sportsmen Who Caused Landowners Trouble

Region	Residence (per cent)		
	Nearby village or within county	City or metropolitan area	Unknown*
1	29	48	22
2	17	79	3
3	21	59	21
4	56	54	31
5	55	18	27
6	79	16	5
7	8	56	36
8	14	58	29
Average§	35	49	22

* Owner either did not know or said he had no trouble.
§ Some owners reported more than one locale.

had the heaviest influx of hunters from the New York City area, and 31 owners reported trouble with hunters from that locality. New Jersey hunters were particularly well represented in Region 8 where 23 owners mentioned problems with them. In general, the largest metropolitan area within a region or contiguous to it (such as Syracuse, which is on the boundary of Regions 3 and 4) was considered to be the principal source of hunters who caused trouble.

A few owners posted for the first time when they recognized that game populations on their land and adjacent lands were declining. Some wanted to "give the game a chance to come back". Others said, "There isn't that much game around here to begin with, and I would like the first crack at it."

Some landowners felt they had to post their land when it seemed to them that the number of hunters gaining access to it had suddenly

multiplied since the previous year. By posting they could at least cut down on the number of hunters or perhaps even eliminate them entirely. "Just too many hunters" or "If I didn't post I'd be overrun with hunters" was a familiar response given by those interviewed.

Many owners posted their lands for the first time when a second party requested it. The "second party" was generally a rod and gun club; however, second parties originate in many different ways and for a variety of reasons. Among the types encountered were friends of the family, a relative, the son of the owner, a neighbor, a small group of men, and rod and gun clubs. In some instances the owner himself joined or was a member of the local rod and gun club and made his land available to them.

Often the "neighbor" was a farmer who influenced or requested his neighbors to post their land in order to reserve it for their personal use, i.e., all posting farmers could hunt on each other's land plus their own land. Even within this type of posting there were variations; some farm cooperatives resulted from mutual agreements among all contiguous owners, while others represented the efforts of one farmer who induced his neighbors post. In a few instances the owners adopted a name for their "rod and gun club" and posted their boundaries with a typical rod and gun club sign. In the town of Rodman in Jefferson County, a group of farmers posted 897 acres and called themselves the "Tremains Corners Club".

There were also situations where mutual agreement did not exist even though all the farms in a particular area were included in the posting. These farmers were more or less forced into joining their neighbors to avoid repercussions. One such farmer was especially unhappy because one of the members of the group allowed many friends to hunt, causing a large number of hunters to roam his land at will.

The Poster

Previous literature pertaining to land posting did not reveal specific studies into the cost and effectiveness of the poster signs themselves. During the interviews, therefore, the landowners were questioned concerning the average cost of the signs and whether this restricted the number or type purchased, whether the signs used met legal requirements (also studied under Phase I), damage to the signs by sportsmen, whether the signs were effective in regulating and controlling hunters and fishermen, and whether the signs were posted on a permanent basis.

Regarding the financial burden involved, the survey revealed that, in all regions except 6 and 7, the average annual cost of posting was

ABLE 22. AVERAGE ANNUAL COST OF POSTING

Region	Type of landowner				Average
	Absentee	Second-party	Non-farmer	Farmer	
. . . . .	$5.00	$2.50	$3.39	$3.45	$3.59
. . . . .	..	..	7.00	7.00	7.00
. . . . .	3.00	6.00	6.15	6.70	5.46
. . . . .	4.50	3.50	8.23	6.09	5.58
. . . . .	..	..	9.00	4.25	6.62
. . . . .	20.25	..	101.25	7.50	43.00
. . . . .	20.00	8.00	6.80	11.90	11.68
. . . . .	6.92	4.00	7.70	10.61	7.31
Average	9.95	4.80	18.69	7.69	11.00

nder $8.00 per landowner (Table 22). In Region 6 this figure vas especially high because one owner had purchased $150.00 worth of igns only a few months prior to the survey. This owner could not be ertain how many years the signs would last. Therefore, the price or this single purchase was included in the average for the region. Although the cost of the posters did not include the labor involved n putting them up, the average cost was not prohibitive and therefore did not seem to deter owners from posting if they so desired. Many owners simply bought a few signs every year to place "along the road", or in other instances the signs were purchased in bundles of three or four dozen or several hundred which would last for a few years, depending on the size of the property and the extent of the boundary to be posted.

On a statewide basis it was found that the majority of owners used the more economical cardboard (or hard paper) type of sign (Table 8). These signs cost from 5 to 20 cents each. Some owners went to the expense of buying more permanent metal or plastic signs. Rod and gun clubs, especially, tended to purchase posters of the more expensive materials.

An average of 59 per cent of the owners believed that their property was posted legally (Table 23). This compares with 58 per cent of the entire sample that was recorded as being legally posted from roadside observations only.

Regarding the message on the poster and its effectiveness, over 90 per cent of the owners preferred "no trespassing" or simply the word "posted". Very few believed that a message inviting the hunter on their land with written or verbal permission would solve the dilemma of unfortunate experiences occurring. The major reaction to this suggestion was generally, "Well, you know the good hunters ask

Table 23. Owners Who Believed Their Land Was Posted Legally

Region	Type of landowner (number)				Percentage of owners in region
	Absentee	Second-party	Non-farmer	Farmer	
1	3	6	15	19	48
2	..	1	5	8	38
3	3	5	11	9	72
4	3	6	9	9	49
5	..	2	5	1	79
6	2	1	6	1	53
7	1	3	6	3	33
8	11	19	19	12	76
Total	23	43	76	62	59

anyway", or "If they're good sportsmen, they shouldn't have to be reminded", or "It could discourage the good hunter, while the poor hunter would gain access anyway without asking." For those owners who preferred complete privacy on the land for their own purposes, the standard message was, of course, adequate and acceptable. For unknown reasons, Region 1 had more signs than any other with the "request permission" message.

More than half (60 per cent) of the owners believed that their signs were serving their purpose (Table 24). This was not interpreted to mean that complete control was being achieved; many owners were satisfied if the signs at least kept down the numbers of hunters or, perhaps encouraged the good sportsmen to request permission.

Table 24. Owners Who Reported Damage to Their Signs

Region	Type of landowner (number)				Percentage of owners in region
	Absentee	Second-party	Non-farmer	Farmer	
1	4	4	8	8	27
2	..	1	1	6	28
3	..	..	5	5	28
4	2	1	5	7	27
5	..	..	3	2	45
6	2	..	5	1	42
7	2	1	4	7	36
8	4	5	8	9	33
Percentage of owners in category	44	17	30	37	32

TABLE 25. OWNERS WHO REPORTED THEIR SIGNS WERE SERVING THEIR PURPOSE

Region	Type of landowner (number)				Percentage of owners in region
	Absentee	Second-party	Non-farmer	Farmer	
1	3	6	20	22	57
2	1	3	6	9	66
3	1	7	11	14	85
4	1	6	15	13	64
5	..	1	4	..	45
6	1	1	4	1	37
7	..	2	8	6	41
8	8	16	10	5	49
Percentage of owners in category	44	58	59	57	60

There was also evidence that many hunters damaged signs, either by tearing them down or shooting at them: 32 per cent of the owners reported such damage (Table 25). This is another unfortunate activity which only a minor proportion of hunters indulges in, but can in turn lessen the hunting opportunity on private lands for countless others.

Another consideration was whether or not landowners generally posted on a year-around basis or simply for specific seasons, i.e., taking down signs after the large or small game seasons. While the results did show that a very high proportion of the owners posted on a permanent basis, it should be noted that, when the non-interview field survey was conducted during Phase I in the months of February, March and April, the conservation officers recorded all parcels along town roads that had signs posted and considered these as permanent since they were up during the non-hunting season. Therefore, any owner who may have posted temporarily (owners who actually removed signs) would not have been included in the survey. However, 94 per cent of the owners interviewed preferred to post the year around (Table 26).

Nevertheless, it was not unusual to have owners remark, "Well, I just don't bother to take them down", or "I'm really only interested in the small or large game season, but I leave the signs up anyway". However, less than 1 per cent of the owners actually removed their signs after specific seasons. Regarding a more specific message which would inform sportsmen as to the season for which the posters are designated, less than 1 per cent thought that this might be worthwhile.

Although this investigation did not include non-posting owners, a few were contacted. Some of these did not post because either they

Table 26. Owners Who Posted Their Land on a Permanent Basis

Region	Type of landowner (number)				Percentage of owners in region
	Absentee	Second-party	Non-farmer	Farmer	
1	4	14	26	40	94
2	1	4	10	12	93
3	3	7	14	13	95
4	4	12	20	16	95
5	..	1	7	2	91
6	3	..	10	2	79
7	4	6	14	14	97
8	13	21	27	14	94
Total	32	65	128	113	94

didn't have time or, as some said, "They [the hunters] ignore the signs anyway, so why fight it." A few felt that the public should have the right to hunt on their land if they so desired.

Posting by Second-party Owners

Some owners preferred or allowed specific groups or individuals to post and/or hunt on their land, and these were designated second-party owners. The interviews revealed some of the reasons why owners allowed second parties to use their property, including various ways in which hunting rights were conveyed (Table 27). The two primary reasons given were: (1) someone else posted the land (54 per cent),

Table 27. Owners Giving Various Reasons for Allowing Second Parties to Post Their Land for Hunting Purposes

Reason	Region								Percentage of owners in region
	1	2	3	4	5	6	7	8	
Financial	..	1	..	2	1	..	3	3	14
Land is posted	6	..	3	7	1	..	2	20	54
Number of hunters is restricted	6	..	2	6	1	..	2	18	49
Surplus game is controlled	..	..	..	..	1	..	1	1	4
Land is patrolled	1	..	..	2	1	..	2	14	28
Other*	8	5	3	7	1	1	3	3	42

* Includes benefits to friends, relatives, private individuals and New York State Conservation Department, as well as owner's membership in gun club.

and (2) it restricted the number of hunters (19 per cent). Also, 28 per cent of the owners indicated that it resulted in their land being patrolled, while a financial return was important to only 14 per cent.

Hunting rights were granted in two principal ways, i.e., a verbal agreement or a formal written lease. The majority, were granted by verbal agreement (Table 28). Written leases were made mostly with small private groups with limited membership, rod and gun clubs with unlimited membership, and the New York State Conservation Department. Lessors who granted leases to the Conservation Department were primarily those under the Federal Aid small marsh development program. A single owner was a cooperator in the FWMA program. Verbal agreements were also made with some private groups and rod and gun clubs; however, the majority involved family, friends, relatives or neighbors. In some instances, the owner himself belonged to the rod and gun club to which the rights were granted.

Included among the second-party owners who were interviewed were representatives from two forest products companies. Although some forest products industries (notably paper companies) are experiencing excellent landowner-sportsmen relationships under the FWMA program, the two companies contacted during this survey continued to prefer to manage their lands privately.

One, located in Region 4, had 40,000 acres leased to rod and gun clubs (approximately 14,000 acres were in the sample town) and has allowed outside groups to lease their lands since 1955. This particular company listed fire protection as its chief reason for allowing second

Table 28. Manner in Which Hunting Rights Were Granted to Second-party Owners and Type of Group Involved

Item	Region								Total	
	1	2	3	4	5	6	7	8	Number	Per cent
Verbal agreement	12	4	6	10	1	1	5	12	51	71
Formal lease	3	..	2	3	1	..	1	11	21	29
Type of group										
Rod and gun club (open)	1	..	3	..	1	1	2	17	25	3
Private group (closed)	6	..	2	6	1	..	1	3	19	26
Other*	8	4	3	7	1	1	3	3	30	40

* Includes friends, relatives, private individuals and New York State Conservation Department, as well as instances where owner belonged to gun club involved.

parties to use their lands for hunting purposes. It's representative pointed out that by allowing selected rod and gun clubs to use their land the number of hunters was automatically reduced, which in turn decreased the potential fire hazard which would exist if the public were allowed on the land at random. He also stated: "You can't trust the general public hunter, but by allowing the gun clubs on our land we know there will be a greater feeling of responsibility and awareness on the part of each member to be careful, with fire in particular." He also mentioned two other reasons for leasing their land: (1) the 25 cents per acre charge aids in reducing the tax burden, and (2) the gun clubs actually do the posting for the company. For an additional $40.00 this company will allow each club to build a camp if they so desire.

Similar reasons were given by the president of the second company, which was located in Region 5. He said, "We prefer gun clubs over the general public hunter as they [the gun clubs] are more concerned about and cognizant of the land." In addition, he mentioned that "prior to the leasing of land to gun clubs, we had many deer jacked". Other reasons cited were: the number of hunters is restricted; the fire hazard is reduced; club members are generally cognizant of good conservation practices, and they abide by the Fish and Game Law; taxes are entirely paid; and, finally, someone else patrols the land. It was also pointed out that the company prefers local clubs only, although three times the financial return could be realized from New York City groups.

Patrol of the Land

In order to obtain some insight into the measures which landowners employ to regulate and/or control hunters on their property, the field interview questionnaire included a series of questions pertaining to patrol of the land. Results showed that 267, or 74 per cent, of the owners did not patrol their lands at all, either indicating it was a nuisance or that they just didn't have the time (Table 29). Those who considered it a "nuisance" to patrol usually felt that they just did not want to be bothered, they physically could not patrol or, as many stated, "It doesn't help anyway". Those who said "patrol was not needed" were owners who experienced little or no trouble with hunters.

Of the 94 owners who did patrol their lands, 69 per cent reported doing it themselves, 7 per cent hired others to patrol, while the remaining 23 per cent depended upon their lessees to keep a vigilance on their property. Owners who patrolled the land themselves usually did so under the following circumstances: (1) when they heard shoot-

Table 29. Degree to Which, and by Whom, Posted Lands were Posted

Item	Region								Total	
	1	2	3	4	5	6	7	8	Number	Per cent
Not patrolled because										
Nuisance, no time, etc.	40	13	18	29	1	2	10	34	147	41
Not needed	39	15	14	12	4	9	16	11	120	33
Patrolled	10	1	7	14	6	8	13	35	94	26
Total	89	29	39	55	11	19	39	80	361	100
By whom patrolled										
Owner	8	..	6	8	6	7	11	19	65	69
Hired patrolmen	2	..	..	2	..	1	..	2	7	8
Lessee	..	1	1	4	..	..	2	14	22	23
Total	10	1	7	14	6	8	13	35	94	100

ing; (2) while they were working in the fields; (3) when they themselves were hunting. When owners hired others to patrol, the people usually were caretakers or managers already in the employ of the owner. One owner in Region 8, however, did hire his own private wardens. This particular owner had had some very unhappy experiences with hunters, such as bullets shot into the cab of his truck and home. He pointed out that during the big game season he stationed his wardens at all the strategic road intersections leading to his land in order to control hunter access.

In general, the evidence demonstrated that the landowners interviewed in this study were cognizant of potential hunter misconduct although only 26 per cent actually participated in some form of land patrol. Of the 41 per cent who regarded the activity as a nuisance, there were many who would like to patrol but found it was not feasible to do so.

Hunting and Fishing Opportunities and Participation by Landowners

The landowners were questioned concerning the hunting and fishing opportunities available on their lands and the extent to which they participated in these activities. They were also asked their views on related aspects of hunting and fishing by the public.

In their opinion, hunting opportunities existed on 99 per cent of the parcels (Table 30), and 70 per cent of the owners reported that they themselves or members of the family hunted (Table 31). The corresponding figures for fishing were 36 and 46 per cent, respectively.

Table 30. Percentage of Parcels Offering Hunting and Fishing Opportunities

Region	Type of landowner				Total
	Absentee	Second-party	Non-farmer	Farmer	
Hunting					
1	100	100	100	95	99
2	100	100	100	100	100
3	100	100	100	100	100
4	100	100	100	100	100
5	..	100	86	100	95
6	100	100	91	100	98
7	100	100	100	100	100
8	100	100	100	100	100
Total					99
Fishing					
1	75	..	21	14	17
2	..	..	30	7	14
3	33	13	21	29	23
4	100	38	31	39	47
5	..	50	43	50	45
6	50	100	64	67	63
7	50	50	43	43	44
8	29	30	37	38	34
Total					36

Table 31. Percentage of Landowners Who Said They or Members of Their Family Hunted and Fished, and Extent of Their Hunting

Item	Region								Mean
	1	2	3	4	5	6	7	8	
Hunted	63	79	74	78	64	79	67	69	70
Fished	44	21	46	55	55	33	51	44	46
Extent of hunting									
Owner's land	65	86	72	78	64	74	51	71	70
Neighbor's land	34	62	13	36	27	26	15	24	29
Beyond county	11	14	8	11	9	11	8	13	11

When asked, "Where do you do your hunting?", 70 per cent reported hunting on their own property, while 29 per cent reported hunting on

their neighbors' land also. In contrast, only 11 per cent reported going beyond the county for hunting purposes. Many farmers in particular pointed out that they had very little time to hunt on their own land, let alone beyond the county.

When owners were asked, "Do you or other hunters get a reasonable harvest when hunting on your land?", 62 per cent reported that hunting was fair to good (Table 32). However, owners within the

TABLE 32. OWNERS WHO REPORTED A REASONABLE HARVEST OF GAME ON THEIR LAND

Region	Type of landowner (number)				Percentage of owners in region
	Absentee	Second-party	Non-farmer	Farmer	
1	1	11	18	31	69
2	..	1	3	4	28
3	3	6	7	13	74
4	2	8	16	12	69
5	..	..	4	2	55
6	2	1	7	1	58
7	3	3	8	7	54
8	4	8	18	7	46
Total	15	38	81	77	62

same town, sometimes on the same road, often gave opposing opinions, depending on their personal concept of what constitutes good or poor hunting.

Owners were also requested to report the primary kind of hunting and fishing that was available to sportsmen on their land (Table 33). Except in Regions 1 and 7, over 90 per cent of the owners cited big game hunting, and a like proportion cited small game hunting except in Regions 2 and 7. Very few owners reported fishing to be available on the posted premises.

Another important aspect of the survey was to determine the number of owners who would allow hunting by strangers if the hunter requested it first. Only 50 per cent would do so, whereas 83 per cent would allow access to friends and relatives (Table 34). A further breakdown according to type of ownership is given in Table 35.

In a study in three counties in Pennsylvania, Barclay (1965) found that 90 per cent of the landowners who posted would allow hunting on request. Barclay's study considered both posting and non-posting landowners. Larsen (1959), in a statewide study in Massachusetts, found that 59 per cent of the posting owners would allow hunting with permission.

In southern Ontario, McCrimmon (1959) found that, of those full-time farmers who posted against trespass, 70 per cent usually

Table 33. Number of Landowners of Different Types According to Hunting and Fishing Opportunity They Reported Available on Their Land

Type of landowner	Region								Percentage of owners in category
	1	2	3	4	5	6	7	8	
Big game									
Absentee	3	1	3	3	..	4	3	12	85
Second-party	6	4	8	13	2	1	5	23	86
Non-farmer	21	9	13	17	7	11	13	26	89
Farmer	22	14	14	17	2	3	13	14	80
Percentage of owners in region	58	97	97	91	100	100	87	94	
Small game									
Absentee	4	1	3	4	..	4	3	11	88
Second-party	14	4	7	13	2	1	5	23	96
Non-farmer	25	9	12	18	6	10	13	25	89
Farmer	41	10	14	16	2	3	13	15	93
Percentage of owners in region	94	83	92	93	91	95	87	93	
Fishing									
Absentee	..	..	..	..	..	1	1	1	9
Second-party	..	..	..	1	..	..	2	3	8
Non-farmer	2	1	..	2	..	2	4	3	11
Farmer	..	1	..	3	..	..	1	2	6
Percentage of owners in region	2	7	..	11	..	10	21	11	

Table 34. Landowners Who Would Allow Others to Hunt When Permission Was Requested

Region	Friends and relatives		Strangers	
	Number	Per cent	Number	Per cent
1	76	85	50	56
2	25	86	16	55
3	32	82	24	62
4	44	80	22	40
5	7	64	5	45
6	16	84	5	26
7	34	87	23	59
8	66	83	24	30
Total	300	83	169	50

Table 35. Proportion of Landowners of Different Types Who Would Allow Strangers to Hunt When Permission Was Requested

Type of landowner	Per cent
Absentee	21
Second-party	58
Non-farmer	42
Farmer	53

allowed access to strangers on request. In another study in which both posting and non-posting owners were surveyed, Slocum and Empey (1954) found that 86 per cent of the full-time farmers in the State of Washington allowed the general public to hunt if permission was requested. Green (1960), in a study of the conservation activities of non-farm landowners in Broome County (New York), found that 70 per cent of both posting and non-posting owners would allow hunting if a request was made. It is logical that this figure should be higher than the 42 per cent derived in the present study based wholly on landowners who posted.

The primary concerns of owners who would allow "hunting with permission" by the general public were the opportunity: to know who the hunters are; to explain where they may hunt and to urge them to be careful of specified crops, recently seeded areas, cattle, men working the fields, children playing, and the like; and to prevent an undesirable group (in the opinion of the landowner) from gaining access at all. In order to control the number of hunters on their land at any one time, owners also like to know how many hunters are in a party. Many landowners related unfortunate experiences in which an individual hunter would come to request access and then be joined by a carload or more of additional hunters. In numerous cases this type of behavior on the part of the hunter resulted in a landowner posting for the first time.

It was surprising to learn that, of the four ownership types, second-party owners most frequently allowed strangers to hunt. This is of interest because in the more restrictive agreements between lessor and lessee the number of people, other than those in the group leasing the parcel, are limited or excluded entirely. On the other hand, second-party owners were already conditioned to the existing hunting activities on their land, which perhaps gave some of them a different perspective concerning the over-all hunting situation.

In the case of absentee owners, 21 per cent allowed hunting with permission. In general, these were the most restrictive of the four ownership types, although in most instances (except for those absentee

Table 36. Primary Intent of Posting as Stated by Landowners Interviewed

Region	Regulation and control		Complete prohibition	
	Trespassing	Hunting	Trespassing	Hunting
1	17	56	12	4
2	2	20	5	2
3	..	30	8	1
4	7	37	8	3
5	..	6	3	2
6	9	7	2	1
7	8	25	5	1
8	20	47	12	1
Total Number	63	228	55	15
Per cent	18	63	15	4

owners with hunting camps) the owner was seldom available for obtaining permission, particularly those who only used their land during the summer.

When owners were asked specifically what their true intent was for posting in the first place, 80 per cent indicated they were primarily concerned about regulating and controlling trespassing and hunting rather than wholly prohibiting the general public from using their land (Table 36). Their objectives were the same as those discussed with respect to hunting with permission.

Only 36 per cent of the owners interviewed reported that there were fishing opportunities on their land, although 46 per cent indicated that they or someone in the household did some fishing. These for the most part involved small farm ponds used exclusively by the owner and his family. Many of these farm ponds did not sustain adequate fish populations for persons other than the owners themselves. The farm ponds were generally located in such a way that they were not visible from the highway bordering the property. Also, it was apparent that, except for local youngsters, farm pond fishing did not attract fishermen to the extent that an access problem was created.

Habitat Improvement

Information was obtained concerning any efforts that landowners interviewed had made to carry out habitat improvement or employ other management practices to encourage wildlife on their property (Table 37). It was encouraging to find that, on a statewide basis, 22 per cent of the owners of posted land engaged in some form of habitat improvement on their lands. Absentee owners were the most active. Second-party owners and farmers often felt that they had "built-in" improve-

TABLE 37. LANDOWNERS WHO HAD DONE HABITAT IMPROVEMENT WORK ON THEIR PROPERTY

Region	Type of landowner				Percentage of owners in region
	Absentee	Second-party	Non-farmer	Farmer	
1	2	1	3	6	13
2	1	2	..	1	14
3	1	2	1	2	15
4	2	1	9	3	27
5	..	..	1	1	18
6	2	..	4	1	37
7	..	2	2	4	21
8	5	2	8	3	23
Percentage of owners in category	38	14	21	17	22

ments in the form of their annual crops. A statement made by numerous farmers was, "I already have existing habitat with my woodlands and crops." The major practices that owners reported were planting trees and shrubs, feeding pheasants, deer and turkeys, developing marshes, constructing ponds, making brush cuttings, and leaving crops standing for game. While most thought of improvements in terms of good hunting population levels, there were also a great number who expressed an interest in wildlife from a purely aesthetic viewpoint.

FARMER COOPERATIVES; THE FWMA PROGRAM AND OTHER INCENTIVES NOT TO POST

Landowners were asked whether they posted as members of a farmer cooperative. They were also queried regarding their knowledge of or interest in the Fish and Wildlife Management Act program and whether, if certain incentives were offered, they would refrain from posting. The incentives were similar to and correlated with some of the main features of the existing FWMA program. However, no effort was made to "sell" the program or to convince owners that they should accept any of the incentives suggested. The replies are summarized in Tables 38 and 39.

A surprising number of farmers were involved in cooperative agreements with contiguous neighbors to post their respective lands. Of the 123 farmers interviewed, 34, or 28 per cent, were involved in this kind of arrangement. One of the larger groups encountered was in Region 2. This group called themselves the "Farmer's Protective Hunting Club" and consisted of 11 members with a total of 1,723 acres.

Table 38. Landowners Who Responded Affirmatively to Questions Concerning Cooperative Programs

Question	Region								Total	Percentage of owners in region
	1	2	3	4	5	6	7	8		
Do you post as a member of a local farmer cooperative (asked of farmers only)	8	5	6	7	..	3	3	2	34	28
Are you aware of the FWMA program	8	2	3	10	1	6	5	14	49	14
Are you familiar with any FWMA area	2	..	..	4	..	2	2	11	21	6
Would you like to learn more about the FWMA program	23	13	2	12	6	..	8	15	79	22
If you already belong, are you satisfied	..	..	..	..	..	..	..	1	1	<1

Table 39. Landowners Who Said They Would Refrain From Posting If Certain Incentives Were Offered

Incentive	Per cent
Reimbursement	5
Adequate protection	7
Regulation of the number of hunters and fishermen	6
Erection of signs by State	7
Available safety zone signs	7
Regular partol by conservation officers	7

In some instances (as pointed out under "reasons for first-time posting") a farmer had little choice but to join the group to avoid unnecessary friction with his neighbors. However, in most instances there seemed to be mutual agreement among all concerned. One such farmer in a heavily posted town in Region 2 explained that, after years of trying to screen the good from the bad hunters, he finally gave up and initiated a farm cooperative program with all his contiguous neighbors. This farmer, who had owned his land for 36 years, had started posting only 6 years before because of numerous incidents of poor hunter conduct such as does being shot and left behind in the woods, turkeys being shot during deer season, being ordered off his own land, having property stolen, having his house shot at, and so

forth. His final statement was, "Give us time and we'll post the whole town."

Of the 361 landowners interviewed, only one was a participating member in the FWMA program. Only 14 per cent had heard of or thought they knew of an area where such a program was active. Although 79 owners, or 22 per cent, did express an interest in learning more about the program, it was felt that perhaps only half of these owners were truly enthusiastic about it or would wish to participate in it if they could qualify. One owner who was already a member (a full-time farmer in Region 8) was very pleased with the program. He stated, "I just don't worry about my former hunting problems any longer." But, the majority generally had reserved or uninterested attitudes toward both the FWMA program and the incentives suggested. Most felt that "the State has too much authority already".

Although the suggested incentives for opening their lands to public hunting included a number of items which would normally be considered as logical considerations acceptable to landowners, the over-all response was negative. Examples included reimbursement for land use, provision for safety-zone signs and regular patrol by conservation officers. It was especially surprising to discover that only 24 owners, or 7 per cent, were interested in regular patrols by conservation officers and that only 5 per cent desired adequate protection, i.e., if a conservation officer were called, immediate aid would be at hand. Experience during the interviews indicated that even though help might be "right around the corner", landowners continued to be reluctant to depend upon this aid and posted their land anyway. Many owners expressed the feeling that there were not enough conservation officers available to handle simultaneous calls throughout a town.

During a survey in Broome County (New York) in 1961, in which both the effectiveness of using radio-equipped patrol cars in apprehending hunting violators and the reactions of landowners to this swift method of law enforcement were studied, 16.2 per cent of the landowners contacted posted their land (Doig, 1962). In connection with a follow-up survey in 1962, conservation officers used two-way radios in the same area, and 99 per cent of 261 landowners (posting and non-posting) felt that the plan would help in detering malicious hunters in addition to providing better service from conservation officers. Yet, 17.6 per cent of the owners stated that, even with the patrol plan in operation, they would continue to post. Nevertheless, the study did demonstrate that with adequate communication a phone call from a landowner could be answered anywhere in the county within minutes of the time it was received.

The few owners (5 per cent) who believed it was a good idea to

have hunters pay them to hunt were interested primarily in a financial return to help pay their taxes. The argument against being paid given by most landowners was that they, too, enjoyed hunting and wouldn't want to pay. However, one owner (a non-hunter who owned a 408-acre hilltop farm in Region 3) pointed out that I'm not interested in the money, only in regulating the number of hunters." He charged a nominal fee of $1.00 per hunter per day in addition to giving each a written permit. It was estimated that some 12 to 20 hunters used this man's land during the big game season although many other hunters requested permission.

In essence, the owners preferred to regulate and control their own lands. Again it should be pointed out that only those owners who actually posted their lands were contacted. An investigation of the non-posting landowners might perhaps reveal different attitudes and philosophies toward posting.

DISCUSSION

During the course of the study it became apparent that a great many landowners had what seemed to them valid reasons for posting their lands. Some, of course, would post despite any efforts that might be made, but the great majority had taken this step because of specific abuses of their hospitality. If these could be prevented, the rate of posting might be slowed, and some present posting might be eliminated.

The changes or approaches possibly applicable in New York which might help appear to fall in four major categories and pertain primarily to hunters.

1. Improvement in hunter behavior
2. Greater effort to educate hunters in proper landowner-hunter ethics, with more effective dissemination of this inofrmation perhaps through an expanded FWMA program.
3. Arrest and punishment of violators without the landowner being involved.
4. A licensing examination to include knowledge of game animals, landowner-hunter ethics, etc.

Ways in which these might be implemented were often suggested by the landowners themselves. Some have been used, or at least tried, in other states and countries.

So many owners expressed concern over the conduct of sportsmen that it appears a great deal remains to be accomplished in establishing better landowner-sportsman relations. Although the term "sportsman" usually designates both the hunter and fisherman, this survey showed little or no problem with unsportsmanlike conduct by fishermen.

However, relatively few fishing opportunities existed on the parcels included in the sample.

Although certain landowners will always prohibit trespassing of any kind for a variety of reasons, there are many more who are willing to allow hunting and fishing on their lands. For example, 83 per cent of the owners interviewed in this study allowed friends and relatives to hunt, while 50 per cent allowed strangers to trespass with permission. If 50 per cent continue to allow hunting with permission, future hunting prospects would appear to be relatively good.

However, if the five major reasons for posting as defined by this study (Table 18) have any significance at all, then it is evident that, in order to sustain present hunting opportunities in the State, some hunters need to be made more aware of the necessity of being good sportsmen. While it is recognized that only a minority of sportsmen would require additional training and education in landowner-sportsman relations, it is also apparent that as the human population grows so too will the "minority". This increasing minority would commensurately increase the "incidents" and perhaps increase the rate of posting.

Barclay (1965) found that as the educational level of landowners rises, their sense of property values likewise rises. He also found that better educated individuals, in general, tend to place greater restrictions on their property. However, the present study showed that landowners had similar reasons, motivations and attitudes toward posting, regardless of their educational backgrounds.

Among the things that most landowners are primarily concerned about is the harm hunters might do to them and their families, property, livestock, fences and crops. Hunters entering without permission "as if they owned the land" is also a major problem. The concept of access without asking is usually assumed for non-posted public or private lands. When this same attitude is extended to posted lands, relationships between landowners and sportsmen become strained. Some owners expressed the view that trespassing hunters do not realize the owners have the same strong feeling of ownership as the homeowner with a small yard. Although there will always be certain persons, whether of urban and rural origin, who never show respect for the property rights of others, it is easier to understand this attitude in the case of the city hunter. Coming from the restrictions of the city or even builtup suburban areas, it does not seem improper to them to roam at will about rural lands.

Many farmers expressed the feeling that they do not have equal opportunity with other hunters to hunt their own lands. These farmers suggested that if other hunters were restricted from their lands during the morning hours, the time of day when they are doing their

chores, they would then have a chance to get "the first crack" at the game, after which others would be welcome.

Another complaint involved correlation of the hunting season with harvest time and the final weeks during which crops are reaching maturity. These farmers believed that if the various hunting seasons could be timed so as not to coincide with harvest time, more amicable relations would result. Others suggested that hunters could help them for a day or two with their crop harvest, repairing fences, or other chores. "If some of these hunters would show up when we could use a little extra help, we would certainly appreciate it and welcome them during the hunting season" was the comment made by numerous farmers.

"If hunters would share some of their game with us we'd probably be more apt to let them hunt" was another comment given by some owners in all categories. These owners felt that, since the game came from their lands, the hunters should share it, at least to show their appreciation for hunting on their land. That many landowners like to be recognized or appreciated by hunters was evidenced by some who expressed their satisfaction at being invited to a dinner which those to whom they had leased their land held every year as a token of thanks for the privilege of hunting.

With regard to the emphasis upon sportsman conduct, Poole (1965) reported that in Idaho, after an 11-year effort, the Idaho Landholder-Sportsman Council made more than a half million acres available to upland game hunters which ordinarily would have been closed to hunting. One of the major activities of this group was to maintain a continuous educational program in good outdoor behavior for all recreationists, particularly hunters and fishermen.

Some owners believed that hunters simply are not aware of what is meant by proper landowner-sportsman ethics. The answer to this problem might be a more vigorous approach by expanding the scope of the FWMA program to include working with sportsmen. Perhaps a campaign directed at the sportsmen might be made to point out over and over again via radio and television the importance of treating the landowner in the same way that he (the hunter) would want to be respected on his own property. In addition to radio and television, posters and literature could be distributed in such places as restaurants, as constant reminders to hunters. The section on sportsman conduct entitled "Let's Team Up" which has been included in recent issues of the State's Hunting, Trapping and Fishing Guide is an imoprtant step and was recommended by the FWMA State Board.

With regard to the FWMA program, a surprisingly small number of landowners (14 per cent) had ever heard of it. This indicates that the general public either has not been made aware of the oppor-

tunities and advantages of becoming a cooperator or possibly is not interested enough in the program to inquire about it. Even though a number of paper companies have become cooperators, their holdings are essentially large tracts of forest associated mainly with big game hunting. Small game hunting is associated chiefly with non-forest lands and is dependent upon the private landowner, in particular the farmer.

The survey revealed that of the four categories of owner the farmer was the last to post his land. Since farmers hold the greatest acreage with the best hunting opportunities, at least for the small game hunter, it may well be their problems that should receive the greatest attention under the Fish and Wildlife Management Act. It has been estimated that in 55 years New York State's population will reach 40 million. Under such population pressures, the future of free public hunting on private lands is obviously threatened. Clearly, a strong FWMA program is needed.

Although the writer does not believe that better and more effective law enforcement will solve the problem, numerous owners did feel that stricter regulations might alleviate the situation. A new approach is being tried in New Hampshire which hopefully will reduce hunter violations to a minimum (Lincoln, 1964). Hunters and fishermen in New Hampshire are forewarned that the license they hold can be cancelled or suspended for violations of fish and game laws. One violation is that of trespass without requesting permission. Lincoln also pointed out that "no longer need the landowner rely for protection on statutes (which may or may not apply to a given incident), on lawyers, and on courts (where lack of evidence or of witnesses is frequently a problem). Instead, in theory he need only apprise the police or local conservation officer when an infraction has occurred, and the Fish and Game Department will take steps from there leading toward possible loss of hunting license."

The New York State Conservation Department has for distribution an excellent pamphlet entitled "Hunter's Guide—Conduct and Safety". If all hunters heeded the suggestions in this pamphlet, there would be few or no landowner-sportsman problems. But how many hunters actually have or read this literature?

Perhaps if hunters were required to pass an examination (as numerous owners suggested), with a very strong emphasis on landowner-sportsman relations, some of the problems might be eliminated or at least substantially lessened. In other words, if a hunter were required to do more than simply pay for his license (granted the hunter safety program is excellent "for hunter safety"), he might also become a better hunter in terms of his philosophy and attitudes toward the landowner on whom his privilege of hunting ultimately depends.

In some parts of the world much is expected of the hunter before a license is granted. For example, in West Germany a hunter must pass a comprehensive examination in order to qualify for a hunting license. The candidate must study and learn many aspects of hunting from a text entitled "Die Jägerprüfung" (a 228-page manual with questions and answers) by Blase (1953). Furthermore, he cannot get his license unless he has liability insurance in the amount of 150,000 marks ($35,000,00) for human injury and 15,000 marks ($3,500.00) for property damage.

It is clear that the posting situation in New York as a whole is not as serious as many sportsmen have believed. However, conditions are changing so rapidly that we should make the best possible use of the experiences of other states and countries in formulating future approaches to the problem.

LONG ISLAND

Although the boroughs of Queens and Brooklyn are geographically part of Long Island they are an integral part of New York City. Therefore, only the counties of Nassau and Suffolk are considered as the "Island" and constitute Region 9 which extends approximately 118 miles eastward to Montauk Point. Long Island lies in the Coastal Plain as defined by Smith (1954). The increase in population on Long Island has been tremendous since about 1948. Before that there were still vast expanses of open fields with many active vegetable farms in Nassau County, while larger Suffolk County to the east had large areas of pine and scrub oak barrens, as well as truck farms with potatoes and cauliflower as their primary crops. The open spaciousness that prevailed into the late 1940's no longer exists. Today, Nassau County is so solidly residential that its county agricultural agent, who used to work mostly with potato and green vegetable farmers, devotes his time principally to giving advice on lawn care and crabgrass prevention (McCarthy, 1964). Even in Suffolk County one must travel at least to the vicinity of Riverhead (approximately 75 miles from New York City) to find extensive areas of farm land. According to Wilkins (personal communication), the major remaining agricultural area on Long Island is in the town of Riverhead.

Because of these radically different conditions, the procedures used in the other regions were not feasible for Region 9. Therefore, a more general survey was undertaken to obtain information on the status of hunting and posting. This included both personal observations and interviews with landowners. Also much information on the hunting situation on Long Island was derived from discussions with members of the State Conservation Department in Region 9.

Despite the steady encroachment of man and his works, sizable populations of certain game species still occur in various localities where their habitat requirements are met. The principal upland species are the cottontail rabbit, gray squirrel, pheasant, bobwhite quail, ruffed grouse and woodcock. Also, the marshes and coastal waters about the Island are frequented, especially during migration, by large numbers of waterfowl. Deer are numerous enough to be a nuisance at times, but hunting for them is prohibited because of the density of the human population.

But unposted areas where hunting is feasible are few. Local residents who know where to go and who to ask, along with organized rod and gun clubs, constitute the majority of sportsmen who hunt in this region. Others find it very difficult not only to find a place to hunt but also to obtain permission. The largest single area where the unaffiliated hunter can hunt without fear of infringing on restricted property is the Suffolk County Cooperator Area. This area, established through the FWMA program, comprises a unit of 4,400 acres near Middle Island and a unit of 2,450 acres a few miles to the east in the vicinity of the Grumman Aircraft Company. However, even these areas, or portions of them, may ultimately succumb to the increasing population pressures. In a report on FWMA activities in Region 9, Bently and Taormina (1963) predicted that "impending land use change undoubtedly will cause significant losses to the total acreage available to hunting in the next few years".

In Nassau County upland game hunting for the public hunter is almost non-existent. In 1965 only a few gun clubs existed on the eastern fringes of the county, the huntable area being estimated at less than 1 per cent. A survey by Bromley (1947) revealed that only 5 per cent of the land was open to public hunting, with an additional 4 per cent being posted by rod and gun clubs, shooting preserves and private individuals.

At present, what little public hunting opportunity remains available in Region 9 is virtually all in Suffolk County. According to Taormina and Renkavinsky (1965) huntable cover lies chiefly east of Route 112, a north-south road running from Port Jefferson to Patchogue about 12 miles east of the Nassau County boundary. At the time of the present survey, two of the 10 towns in Suffolk County (Shelter Island and East Hampton) still had population densities of less than 150 per square mile, although this did not necessarily govern the hunting situation there. To some extent, hunting was possible in all 10 towns. In the four westernmost towns (Huntington, Babylon, Smithtown and Islip), it was estimated that less than 5 per cent of the area was available for hunting. This limited area was for the most part controlled by two clubs.

In the town of Southampton, about 5 per cent of the land was available to Long Island residents. However, members of gun clubs could still hunt on approximately 50 per cent. The remaining 45 per cent was divided into the residential areas (35 per cent) and farm land (10 per cent) which was not hunted because of the nature of the crops left little or no habitat for game.

In the town of Brookhaven approximately 10 per cent of the land was available for public hunting, including the FWMA cooperator area, but the areas were predominately scrub oak-pitch pine communities which are poor habitat for most species. Gun clubs leased about 15 per cent of the land. An additional 10 per cent or so was in the hands of speculators and developers. In many of these situations, friends of the owners posted the land for their own use. About 5 per cent was U. S. Government land which was posted. The remainder was residential and restricted against hunting.

Although there are a great many farms in the town of Riverhead, the hunting potential is relatively low. Because of the nature of the crops (potatoes, cauliflower and sod) the farms offer little suitable habitat to game, making posting generally unnecessary. There were no gunclub lands posted in the town. However, approximately 5 per cent of the available, potentially huntable areas were open and not posted.

Southold is another town with extensive farm lands on which the hunting potential is minor or non-existent because of the nature of the crops grown. One potato farmer, to whom the writer spoke, stated that he has never had any problems with hunters and never had to post his land. It was estimated that about 10 per cent of the huntable land was open to hunters.

In the town of East Hampton, some 15 to 20 per cent of the land, primarily in the eastern section of the town in the vicinity of the Hither Hills State Park, was open and available to hunters. Beyond the State park, in the vicinity of Montauk and Montauk Point, gun clubs posted about 5 per cent of the land area.

One of the unique towns in the State, primarily because it is a island, is Shelter Island which is connected with the main land by ferries, both on its northern and southern approaches. Some of the local residents with whom the writer spoke stated that hunters could still hunt in a few places if permission were requested first. However, further study revealed that, while this may have been true, the island was, for all practical purposes, completely posted either by gun clubs or shooting preserves. The last farm on Shelter Island had gone out of business just 3 years before the present survey.

In the final analysis, upland hunting on Long Island is predominantly controlled and dominated by the gun clubs and local resident

hunters. Many of the local residents hunt on small pockets of land of from 1 to 5 acres for as little as 15 minutes and then move on to another parcel. The hunter who does not reside in the vicinity would rarely be aware of these areas. As for the future, there are two schools of thought: (1) that as long as gun clubs can maintain and keep some of their lands there will always be hunting (for a very limited group, however); (2) that the days of upland hunting are numbered. Only time will tell.

With respect to waterfowl, on the other hand, there are still a great many hunting opportunities on Long Island. The majority require either hiring a commercial boat whose owner knows where the better hunting areas are or having a "contact" or friend who owns land in a favorable location. Nevertheless, access to many areas can be had from commercial boat stations or public boat-launching sites.

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DISPERSAL, MIGRATION AND ORIGINS OF STRIPED BASS FROM GREAT SOUTH BAY, LONG ISLAND[1]

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ABSTRACT

To evaluate the potential of Great South Bay as an area for developing a sport fishery for striped bass, 1,917 fish were seined and tagged there from 1956 to 1961, mostly during May and June of 1960 and 1961. They were predominantly ages II, III and IV, and few year classes were represented. Of 281 recoveries, 63.0 per cent were from New York, 11.0 per cent were from New England and 26.0 per cent from areas south of New York. In New York, more came from eastern than from western Long Island waters, and only 2.4 per cent were from the Hudson River. Evidence is presented indicating that the irregular presence of large numbers of striped bass in Great South Bay is related to the appearance of fish from dominant year classes originating outside the State, probably in the Delaware Bay-Chesapeake Bay region. When emigration from the south does not occur to any extent, the principal source of the bay stock may be striped bass of Hudson River origin.

The data indicate that striped bass are present in Great South Bay primarily during May and June. On such occasions, young fish predominate and, at times, about half may have reached legal size. There is reason to believe that a sport fishery might be developed to harvest these fish, particularly if the size limit were reduced.

It has long been known, at least to commercial fishermen, that striped bass (*Roccus saxatilis*) frequent Great South Bay on the south shore of Long Island. However, it is difficult to establish a clear view of the numbers of fish present in this large, shallow bay, their annual fluctuations and migratory behavior. In recent years, negligible fishing effort has been reported for the species in this area by either the commercial or sport fishery. Even during the State survey in 1938 (Neville *et al.*, 1939), only 1,373 pounds of striped bass were landed from April through October, most of the fish being captured during May and June. The principal gear employed was the pound net and the haul seine. These authors also reported that a run of striped bass entered Great South Bay in the fall of 1938 and that anglers took them by trolling, but no estimate of the catch was obtained. According to statistics concerning commercial landings from 1951 to 1963, the catch was small, ranging from 0 to 9,334 pounds and averaging only 1,703 pounds per year (Table 1). Meyer (1965) made brief mention of fishing practices and fishing locations for striped bass in a descriptive article on the sport fisheries of Great South Bay. Most striped bass fishing in the bay is done at night or during early morning, and the principal location is at Fire Island Inlet rather than in the bay proper. Some fish are also taken in the estuaries of rivers and streams entering the bay. He implied that this fishing is restricted to relatively few

[1]A contribution of Federal Aid in Fish and Wildlife Restoration Project F-15-R.

Table 1. Commercial Catch of Striped Bass from Great South Bay, 1954–1963*

Year	Pounds
1954	9,334
1955	1,450
1956	600
1957	350
1958	..§
1959	1,200
1960	..§
1961	800
1962	..§
1963	3,300
Average	1,703

* Source: New York Landings, annual summaries 1954–1963. U. S. Bur. Comm. Fish. and N.Y.S. Bur. Marine Fish. (published by U. S. Dept. Int.)
§ In certain years, because of the small quantities landed, striped bass were not recorded separately.

local anglers and that, in general, the fishing public is not aware that striped bass frequent Great South Bay.

After preliminary investigation during the spring, summer and fall of 1959, a 2-year tagging program was undertaken to learn more about the abundance, size and movements of striped bass in the area of Great South Bay between Conklin Point and Blue Point (Figure 1). It was postulated that, if the presence of substantial numbers of legal-sized (16 inches or more in fork length) striped bass could be established, and if these fish remained available in the bay, a sport fishery might be developed to use the resource.

A creel census conducted from 1956 to 1960 (Briggs, 1962) revealed that there was an inconsequential sport fishery for striped bass within the bay proper, although the species was important to surf fishermen along the barrier beach adjacent to the bay and to fishermen trolling from private boats in Fire Island Inlet and the immediate coastal area. Striped bass constituted less than 1 per cent of the sport catch in the area between the Nassau-Suffolk County boundary and Howell Point at Bellport (Figure 1). Based on data taken from 1956 to 1959, Poole (1962) concluded that the fishery for summer flounder (*Paralichthys dentatus*) was overexploiting the fish available in essentially the same area. Establishment of a sport fishery for striped bass might relieve some of the intense effort expended on this flounder and perhaps favorably disperse the localized concentrations of anglers.

DESCRIPTION OF THE AREA

Great South Bay is the largest of a series of more or less continuous shallow-water embayments extending along the south shore of Long

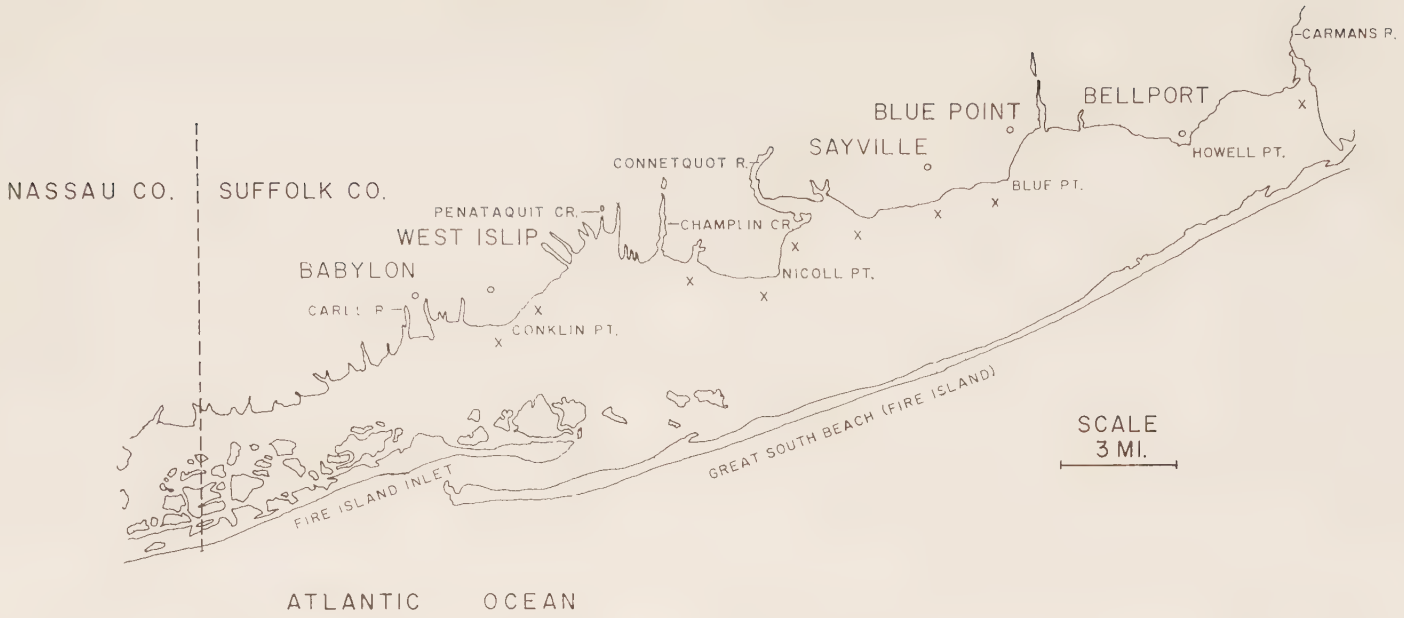

Figure 1. Map of Great South Bay showing mouths of major streams flowing into it and locations where striped bass were tagged.

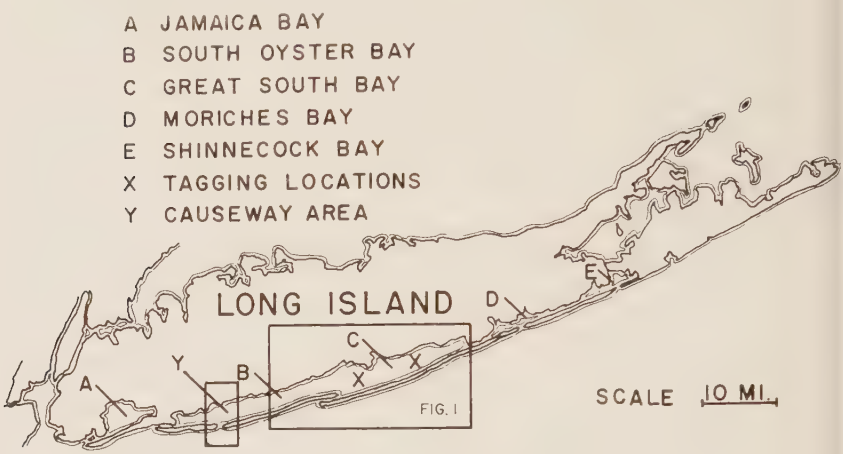

Figure 2. Map of Long Island showing relation of Great South Bay to other south-shore bays and the "causeway area".

Island for a distance of approximately 82 miles (Figures 1 and 2). These bays are separated from the Atlantic Ocean by a narrow barrier beach which is interrupted by six inlets. Great South Bay occupies the central portion and its seaward access is through Fire Island Inlet. It has an area of about 95 square miles and a depth ranging from 2 to 27 feet with an average of 6 feet. The average salinity of the bay water is 23 parts per thousand. The portion chiefly considered in this study, from West Islip to Blue Point, is about 12 miles long and from 1.8 to 5.3 miles wide. On occasion, when searching for striped bass to tag, the study area was extended as much as 10 miles to the vicinity of Carmans River in Bellport Bay, the easternmost extension of Great South Bay.

Great South Bay receives the drainage from the middle and southern portions of Long Island by way of many small creeks and canals and a few major streams. Within the study area, these are the Connetquot River, Champlin Creek and Penataquit Creek. Carmans River to the east and Carll River to the west of the area of immediate interest also represent major drainage basins. Principal tide flows enter the bay through Fire Island Inlet, but there are secondary contributions of ocean water through Jones Inlet on the west and Moriches Inlet on the east. The tidal range to the west is 1.5 feet, but it is only 0.7 feet in the eastern part of the bay where most of the work was done.

The northern shore of Great South Bay is part of an outwash plain in the form of lobe-like projections or necks extending into the bay. Between the lobes lie small estuaries and coves into which flow numerous small creeks. These fan-shaped lobes are often projected

to a point. Both the mouths of the creeks and the points of the necks make favorable seining sites. The shoreline is mostly either sandy beach or saltmarsh sod bank, with shallows extending for a considerable distance into the bay except where channels have been dug. Along shore, the bottom ranges from soft mud to firm sand, and most areas have moderate to heavy growths of benthic algae. The typical shoreline vegetation was *Spartina* and/or *Phragmites* (Figure 3).

METHODS

All the striped bass included in this study were captured by haul seine. The principal seine, which was 800 feet long and 10 feet deep, was made from nylon seine twine, with wings of 3-inch stretched mesh graduated to 2½-inch stretched mesh and a centrally located bag of 2-inch stretched mesh approximately 12 feet wide and 20 feet deep. A warp line of 150 to 200 feet was bridled to the staff at either end of the net. The seine was set by hand from an 18-foot flatbottomed seine boat, and both net and catch were handled by a team of four men. Portions of the seine are shown in Figures 3 and 4.

When striped bass were encountered during a haul they were retained in the bag of the seine (in the water) until preparations for tagging were completed. They were handled as little as possible, merely being measured, tagged and released. Measurements were

Figure 3. Haul seining for striped bass along the *Phragmites*-edged north shore of Great South Bay. (photo courtesy of New York Journal-American)

Figure 4. Small striped bass with soft spaghetti-dangler tag attached between the dorsal fins.

uniformly made to the nearest one-half centimeter in fork length on a standard measuring board.

During the preliminary tagging in 1959 (when only 69 striped bass were marked) serially numbered Petersen disc tags and stainless steel pins were employed. The discs (one red and one white in each case) were one-half inch in diameter and had printed on them a request to notify the Department if recovered. Earlier, however, ¾-inch and 1-inch monel split-ring jaw tags with plastic danglers similar to those described by Vladykov (1957) had been used to mark 34 bass. During 1960 and 1961, data for which were the principal source of information for this paper, a modification of the vinyl plastic tubing and plastic dangler (Atkins type, see Rounsefell and Kask, 1945) combination described by Fritz (1959) was used. Vinyl tubing has been in use at least since the experiments of Wilson (1953) with tuna marking, and Davis (1959) reported on two varieties of vinyl tubing tags (without danglers) used on striped bass.

The plastic tubing, dangler and tagging tool (needle) used during the present study in Great South Bay are illustrated in Figure 5. The cellulose acetate danglers, 25.4 millimeters long by 7.1 millimeters wide and 1.6 millimeters thick, imprinted on both sides with an identifying number and instructions for return, were attached to 305-millimeter lengths of 0.88-millimeter (inside diameter) yellow vinyl

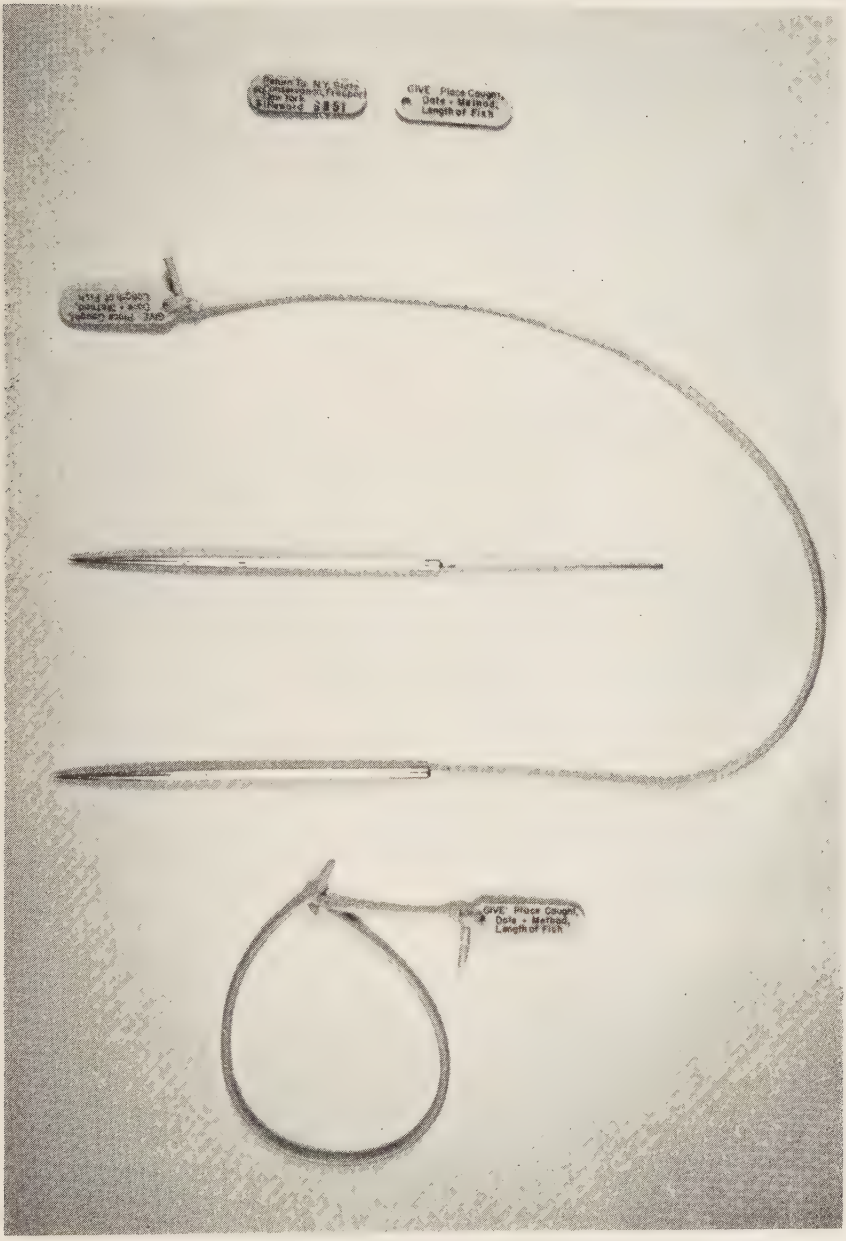

Figure 5. Tags and tagging equipment. From top to bottom: imprinted cellulose acetate danglers; vinyl tubing and attached dangler mounted on tagging needle; stainless steel tagging needle; completed, knotted tag as applied to fish.

tubing[2] with figure eight knots. A stainless steel tagging needle, 130 millimeters long with one end sharply pointed and the other narrowed for 50 millimeters to receive the hollow plastic tubing, was used in attaching the tag. Needle and tag were inserted through the dorsal musculature above the lateral line between the first and second dorsal fins (Figure 4). The tubing portion of the tag was removed from the needle and this free end (opposite the dangler) was tied in a knot to prevent its slipping out. After the first month of tagging this method of attaching the tag was improved to prevent the knot from pulling through the fish. The free end of the tubing was brought over the back of the fish in the form of a loop and securely knotted to the standing end some 30 to 50 millimeters from the dangler (Figure 5).

To recover tags, extensive local promotion and advertisement of the program were undertaken, including the use of posters, press, radio and magazines. Returns from more distant coastal areas were solicitated through wire service releases, publications of the U. S. Fish and Wildlife Service (Market News Service, etc.) and nationally distributed outdoors magazines. A nominal reward ($1.00) and information pertinent to the recovered fish were offered to encourage tag returns.

CONDITION OF TAGS AND TAGGED FISH

Both the soft plastic vinyl ("spaghetti") tubing and the hard plastic dangler were frequently reported to be fouled with a variety of organisms. Davis (1959) reported some hydroid growth on both streamer (nylon) and spaghetti (hard vinyl and soft vinyl tubing) tags applied to striped bass in the Albermarle Sound–Roanoke River region of North Carolina. Carlisle *et al.* (1960) found that vinyl tubing with crimped-on Petersen discs also collected hydroids when used to mark several species of fish in the ocean (surf zone) off southern California. Both types of environment (estuarine and surf zone) are frequented by striped bass and, therefore, it was not unexpected that in the present instance many tag-return letters mentioned masses of "sea weed" growing on the tubing and/or the Atkins dangler. One dried specimen received was composed of hydroid colonies that exceeded 90 millimeters in length and 40 millimeters in width. Other invertebrate growths were reported from the dangler and some specimens were collected, including large barnacles (*Balanus eburneus*) and quantities of small mussels (*Mytilus edulis*) which completely obliterated the tag (Figure 6). In an extensive study of five types of tag used on striped bass in California, Chadwick (1963) reported

[2]P.V.C. size #18, Type UL, supplied by Insul-Tab Company, Inc., Winchester, Mass.

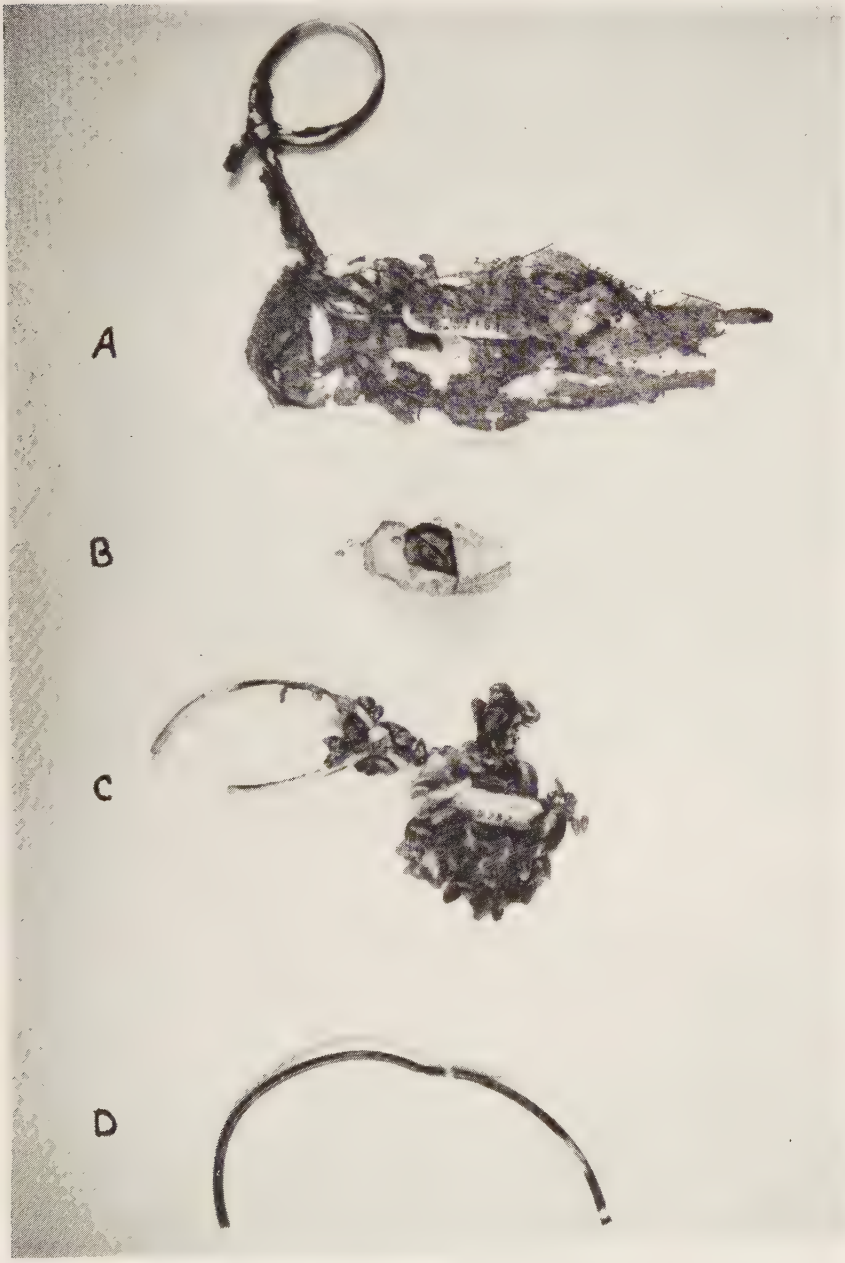

Figure 6. Examples of fouling organisms and discoloration of spaghetti-dangler tags.
A. Hydroids, 4.7 months after tagging (Greenwich, R. I.)
B. Barnacles, 6.5 months after tagging (Amagansett, N. Y.)
C. Mussels, 9.6 months after tagging (Hudson River, N. Y.)
D. Discoloration, 21.5 months after tagging (James River, Va.)

that barnacles often grew on disk dangler tags of the type originated by Calhoun (1953) but that hydroids were far more common. His data showed that growths increased the incidence of tagging sores. Williams (1963) reported, with respect to studies on *Gadus merlangus*, that plastic tags made of material treated with antifouling compounds (phenyl mercury acetate, for example) gave a significantly higher rate of return than tags made of untreated material, after the fish were at liberty 100 days or more.

The vinyl tubing, which was originally bright chrome yellow, was quickly discolored by contact with the fish's tissues. In many cases, when the tubing was returned with the dangler, that portion of the "spaghetti" which had passed through the fish was so blackened that any message, had one been printed on it, would not have been legible. A further potential disadvantage of this soft vinyl tubing was discovered when an appreciable period of time elapsed between tagging and recovery. After about 6 months, a certain amount of hardening and a tendency toward brittleness were observed. There was some evidence that this condition led to loss of the inscribed dangler. On several occasions the vinyl tubing, or a piece of it, was recovered from a fish without the Atkins tag. In every case this appeared to have resulted from a clean break rather than an untied knot.

There were also numerous reports that this tag irritated the tissue and left unhealed, open sores where the needle had penetrated the dorsal musculature. However, there were other reports that the tagging scars were well healed and the tag firmly anchored. Since only tags were returned and the recaptured striped bass were not available for examination, it is difficult to evaluate this aspect of the tag's effects. Those fish that were recaptured by project seining crews exhibited no ill effects from the tagging, and in most cases their wounds had healed. Despite the disadvantages encountered, these tags were recovered from striped bass as long as 1,462 days (4.0 years) after they were released.

RESULTS

Seasonally, between June 1956 and July 1961, more than 1,900 striped bass were tagged and released in Great South Bay. The tagging periods, number of fish and other pertinent data are summarized in Table 2. The most intensive programs were conducted during 1960 and 1961 when 1,814 striped bass were tagged with vinyl "spaghetti" and dangler tags. Of the 281 returns, received by December 31, 1964, from all sources, 246 represented fish tagged during these two years.

Tag Returns

The recovery locations, by states, are listed in Table 3 and ranged

TABLE 2. SUMMARY OF RECORDS FOR STRIPED BASS TAGGED IN GREAT SOUTH BAY, 1956–1961

Year	Season	Number tagged	Recoveries		Type of tag
			Number	Per cent	
1956	June–October	34	6	17.6	jaw§
1959	July–October	69	29*	42.0	Petersen
1960	May–November	1,108	110	9.9	spaghetti†
1961	May–June	706	136	19.3	spaghetti
Sub-total 1960–1961		1,814	246	13.6	
Total		1,917	281	14.7	

* Of these, 14 were taken by project seining in Great South Bay.
§ A monel split-ring jaw tag with plastic plate (Vladykov, 1957).
† Soft vinyl tubing and Atkins dangler as described by Fritz (1959).

TABLE 3. DISTRIBUTION OF RECOVERIES OF 281 STRIPED BASS TAGGED IN GREAT SOUTH BAY

Location	Number	Per cent
New England States		
Maine	3	1.1
Massachusetts	10	3.5
Rhode Island	13	4.6
Connecticut	5	1.8
Sub-total	31	11.0
New York		
Long Island*	163	58.0
Hudson River§	14	5.0
Sub-total	177	63.0
South of New York		
New Jersey	60	21.4
Delaware	4	1.4
Maryland	6	2.1
Virginia	3	1.1
Sub-total	73	26.0
Total	281	100.0

* Includes those taken by project seining in Great South Bay.
§ Includes all New York Harbor, Jamaica Bay and western Long Island Sound.

from Maine to Virginia. A majority of the returns were from New York waters, but only 14, or 5.0 per cent, were recaptured in the Hudson River area including all of New York Harbor (Upper and

Lower Bays) and adjacent waters, and only seven of these were caught in the river itself. The "traditional" wintering and spawning grounds, i.e., Delaware, Maryland and Virginia, accounted for only 13 returns, while New Jersey produced 60 or 82.2 per cent of all those from south of New York.

Recoveries resulted from the use of a wide variety of fishing gear and methods (Table 4). Most of the returns were from coastal sport

Table 4. Returns for Striped Bass Tagged in Great South Bay According to Manner of Recovery

Manner of recovery	Number	Per cent
Sport fishing		
Trolling	28	10.0
Casting	54	19.2
Spearing	1	0.4
Other and unknown	99	35.2
Sub-total	182	64.8
Commercial fishing		
Seine	21	7.5
Trawl	7	2.5
Pound net	1	0.4
Gill net	20	7.1
Other and unknown	11	3.9
Sub-total	60	21.4
Miscellaneous		
Project seining	33	11.7
Tagging mortality	2	0.7
Natural mortality	2	0.7
Unknown	2	0.7
Sub-total	39	13.8
Total	281	100.0

fisheries, and casting of one type or another was the chief method used while trolling was secondary. Among the commercial fisheries, seines and gill nets accounted for most of the tagged bass recovered. Project seining yielded 11.7 per cent of the returns.

Season of Recovery

Distribution of the recoveries according to season[3] and locality is given in Table 5. Only one winter return was from New York: most (80 per cent) were from New Jersey and the rest from farther south.

[3]According to celestial calendar, i.e., spring = March 22–June 21, etc.

TABLE 5. SEASONAL AND GEOGRAPHIC DISTRIBUTION OF RECOVERIES OF STRIPED BASS TAGGED IN GREAT SOUTH BAY

Recovery location	Season				Total
	Winter	Spring	Summer	Fall	
Tagged in 1956					
New York:					
Long Island	..	..	4	1	5
Hudson River	..	1	..	..	1
Total	..	1	4	1	6
Tagged in 1959					
Maine	..	1	..	..	1
Massachusetts	..	..	1	..	1
Rhode Island	..	1	1	..	2
New York:					
Long Island	..	7	10	1	18
Hudson River	1	2	..	1	4
New Jersey	1	..	..	2	3
Total	2	11	12	4	29
Tagged in 1960					
Massachusetts	..	1	3	2	6
Rhode Island	..	4	..	..	4
Connecticut	..	..	1	..	1
New York:					
Long Island	..	40	18	9	69§
Hudson River*	..	3	..	1	4
New Jersey	5	10	3	2	20
Delaware	..	1	..	..	1
Maryland	3	..	..	1	4
Virginia	..	..	..	1	1
Total	8	59	25	16	110§
Tagged in 1961					
Maine		1	1	..	2
Massachusetts	..	2	..	1	3
Rhode Island	..	3	2	2	7
Connecticut	..	..	4	..	4
New York:					
Long Island	..	22	25	24	71
Hudson River*	..	1	2	2	5
New Jersey	14	15	1	7	37
Delaware	..	3	..	..	3
Maryland	..	2	..	..	2
Virginia	2	..	..	..	2
Total	16	49	35	36	136

* Includes all New York Harbor, Jamaica Bay and western Long Island Sound.
§The season taken was unknown for two records from Long Island.

Spring recoveries were predominantly from New York (63 per cent) followed by New Jersey (21 per cent) and New England (11 per cent). Summer returns were predominately from New York (78 per cent) and New England (17 per cent); none was recorded from south of New Jersey. A majority of the fall records (68 per cent) were from New York, but a southward movement was indicated by a decrease in the proportion from New England and a increase in that from New Jersey.

Size Composition

The size composition of striped bass caught and tagged in Great South Bay, in terms of length frequency, is shown in Table 6 and Figure 7. In 1956 and 1959 the fish were taken almost entirely during the summer, while in 1960 and 1961 most specimens were taken during May and June. Although all the length-frequency curves show some similarities, particularly that most of the fish were small, there were evident seasonal differences in size composition. In 1956, 15.7 per cent of the bass were of legal size (16 inches or more in fork length), and in 1959 the proportion was 26.5 per cent. These data, however, involved only small numbers of fish. Those for the other two years were more representative.

In 1960, when 1,108 fish were tagged, the data revealed monthly dissimilarities. Most of the larger bass were present in May when legal-sized fish amounted to 60.5 per cent of those captured and 5.8 per cent were 600 millimeters or more in fork length. But in June the percentage of legal-sized fish fell to 6.4 per cent and that of large fish to 1.8 per cent. From July to November the size composition resembled that observed in 1956 and 1959.

In 1961, when 706 fish were tagged during May and June, the sizes represented were generally similar to those recorded in 1960 but the monthly distribution was different, and there were more legal-sized fish present during the second month (June). The proportion of legal-sized fish in May was 47.9 per cent, and in June it was 26.2 per cent. Large fish made up 9.4 per cent of the population in May but amounted to less than 1 per cent in June.

Because scales were not collected from the bass tagged, aging by this method was not possible, but from the sizes encountered it appears, based on observations of Mansueti (1961), that the fish were predominantly 2 or 3 years old. Except for those for May of 1960 and 1961, all the curves in Figure 7 are essentially unimodal. In 1956 and 1959 the mode fell within the 350–375 millimeter interval. In May 1960, when the distribution was essentially bimodal, the mode for the smaller fish centered about the 275–299 millimeter interval

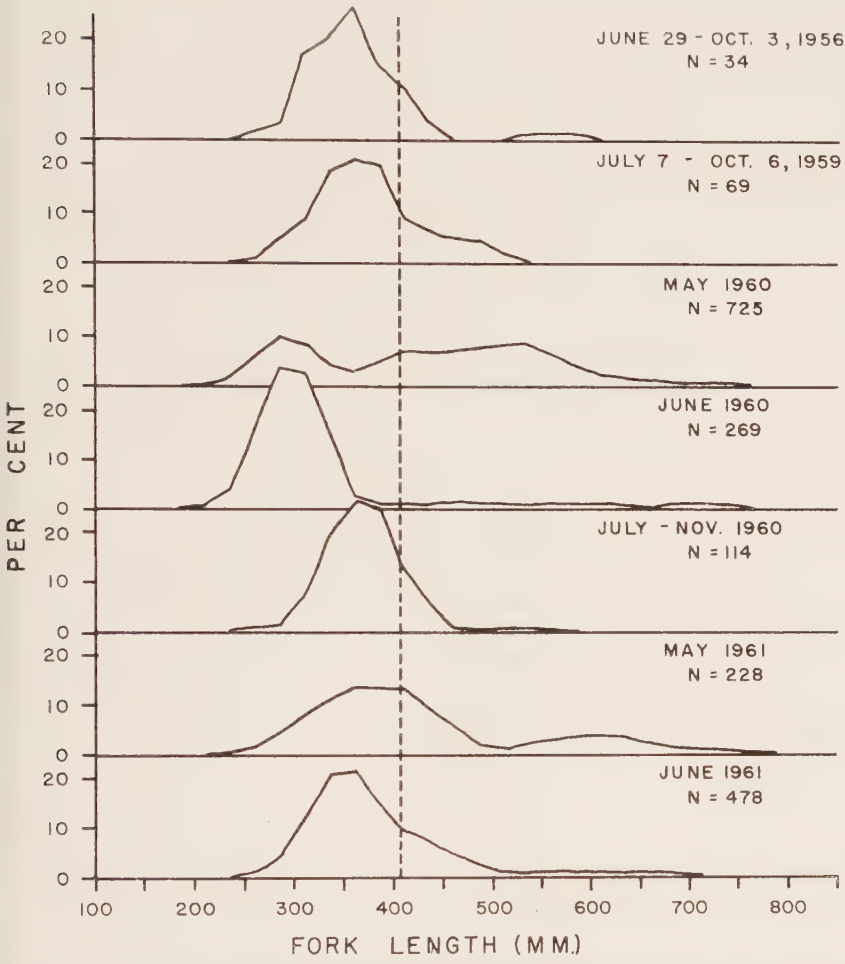

Figure 7. Length-frequency distributions of striped bass tagged in Great South Bay from 1956 to 1961; data smoothed by moving average of three.

and that for the larger ones about the 500–549 millimeter interval. The latter group was not evident during the remainder of the season when the single mode centered about the 275–299 millimeter interval in June and about the 350–374 millimeter interval in the July-November period. In 1961 the distribution was also bimodal in May but not in June, and the modes fell at greater size levels than the corresponding ones for the year before.

These data indicate that in 1960 and 1961 the striped bass population in Great South Bay was dominated by fish of the 1957 and 1958 year classes with representatives of the 1955 year class accounting for the larger fish. There was no evidence from the small samples col-

lected in 1956 and 1959 or the slightly larger sample taken in the summer of 1960 that large striped bass were present in significant numbers after May.

DISCUSSION

The results of the tagging done in 1960 and 1961 indicate that a seasonal sport fishery for striped bass could be developed in Great South Bay based on the presence in May and June of substantial numbers of legal-sized bass before they migrate elsewhere. Once esablished, this fishery would harvest more of these fish than are currently landed within the bay itself and contribute to a greater total catch in New York waters.

In the two years of investigation, about 40 per cent of the striped bass collected during May and June were 400 millimeters or more in fork length and could have been kept by fishermen. Although sport and commercial fisheries in New York eventually accounted for about 60 per cent of the tag returns, the proportion might have been higher if more fishing had been done before migration and dispersal took their toll. For example, although more than 72 per cent of the total returns within the first year after tagging came from New York, the proportion decreased to about 47 per cent in subsequent years. A t-test showed the difference ($t = 4.12$) to be significant at the .01 level. On the other hand, the proportion of the returns after the first year that came from New Jersey and farther south increased.

Age and Year Class

Relatively small fish predominated in the seine catch as shown in Table 6 and Figure 7. It also appears from these data that the abundance of fish in any one year might be substantially dependent upon a few year classes. Therefore, an estimate of age and year-class composition was attempted, although direct determination of age was not possible from the material available.

A number of investigators have presented data on the mean fork length of striped bass of various age groups. Among these are Scofield (1931), Clark (1938) and Robinson (1960) for California, Merriman (1941) for New England and Mansueti (1961) for Chesapeake Bay. Mansueti summarized the age-length relationships presented in ten studies conducted throughout the range of the striped bass. He concluded that most of the studies were in close agreement in their evaluation of average length in relation to age group; what differences there were probably resulted from sample size, gear selectivity and errors in judging age. Therefore, these data were used in conjunction with the length-frequency records summarized in Table 6 to estimate the ages and year classes of the fish taken in Great South Bay.

TABLE 6. LENGTH-FREQUENCY DISTRIBUTION OF STRIPED BASS TAGGED IN GREAT SOUTH BAY

Fork length in millimeters	Season and year tagged							Total	Percentage by group
	June–October 1956	July–October 1959	May 1960	June 1960	July–November 1960	May 1961	June 1961		
200–224	..	..	1	..	..	..	..	1	
225–249	..	..	2	2	..	..	..	4	
250–274	..	..	41	26	..	2	..	69	
275–299	2	2	108	110	1	7	10	240	61.9*
300–324	1	8	65	95	2	18	49	238	
325–349	15	8	12	16	21	33	126	231	
350–374	5	22	14	1	45	27	118	232	
375–399	7	13	37	2	24	34	54	171	
400–424	3	6	52	1	18	27	42	149	
425–449	..	..	63	2	1	26	37	129	
450–474	..	6	40	2	..	9	25	82	
475–499	..	4	52	4	1	4	6	71	34.5
500–524	..	..	71	..	..	1	3	75	
525–549	..	..	50	1	1	4	2	58	
550–574	1	..	54	..	..	7	1	63	
575–599	..	..	25	3	..	6	1	35	
600–624	..	..	11	1	..	7	1	20	
625–649	..	..	11	..	..	8	1	20	
650–674	..	..	8	..	..	4	2	14	
675–699	..	..	4	..	..	2	..	6	
700–724	..	..	3	3	..	1	..	7	3.6
725–749	..	..	..	..	..	1	..	1	
750–774	..	..	..	..	..	..	..	..	
775–799	..	..	..	..	..	..	..	..	
800–824	..	..	1	..	..	..	..	1	
Total	34	69	725	269	114	228	478	1,917	100.0

* Below size that may be taken legally.

Using this approach, the modes of fork length indicated that the few summering fish taken in 1956 and 1959 were mostly 2 or 3 years old and thus from the 1954, 1956 and 1957 year classes. In May of 1960 the smaller fish were chiefly 2 years old and the larger ones probably 4 or 5 years old. In June, however, most of the bass were 2 years old, and the paucity of larger sizes indicated that the older fish had left the bay. The July to November records resembled the pattern of those for 1956 and 1959 and indicated the fish were mainly 2 or 3 years old. In May 1961 a somewhat platykurtic mode of from 325 to 449 millimeters probably reflected a preponderance of 3- and 4-year-old fish, while a smaller mode at 550 to 649 millimeters represented fish 5 or 6 years old. But in June the population seemed to consist mainly of 3-year-olds.

These age estimates suggest that the striped bass frequenting

Great South Bay during 1960 and 1961 were dominated by a few year classes. The smaller and more numerous fish were probably from the 1957 and, more especially, 1958 year classes, while the larger fish were mostly representative of the 1955 and 1956 year classes. The 1958 year class was reported to be a dominant one of great magnitude by Shearer *et al.* (1962) and by Mansueti and Hollis (1963) who also reported an exceptionally good spawning season in Chesapeake Bay in 1956. If it is characteristic of the striped bass population of Great South Bay to be dependent on as few year classes as these data imply, it is probable that a good fishing return, for effort expended, may be expected only after dominant year classes have reached legal size and entered the fishery.

Origins

The origins of the striped bass that frequent Great South Bay are not readily descernible from the information collected during this investigation. Returns from the fish tagged in 1960 and 1961 do not, however, suggest a Hudson River origin, although this river contains the nearest important spawning grounds. Of the 149 tag returns from within New York waters, only three (2.0 per cent) came from the main body of the Hudson. Even when all adjacent areas were included (i.e., Jamaica Bay, Upper and Lower New York Bays, Staten Island and western Long Island Sound) the returns totalled only 11 (7.4 per cent). In contrast, much higher rates of recovery in the Hudson River resulted from the small samples tagged in 1956 and 1959. Of the six returns for fish tagged in 1956, all in New York waters, one (16.6 per cent) was taken in the lower Hudson River in 1958. For the fish tagged in 1959, recoveries from the Hudson River totalled four (18.1 per cent) of the 22 from State waters. Also, as shown in Table 5, none of the striped bass tagged in 1959 was recovered south of New Jersey although some did reach New England.

These data (summarized in Table 7), meager as they are, lead to the conclusion that the fish marked in 1956 and 1959 were of more local nature and may have originated in the Hudson River, while those marked in 1960 and 1961 bass, which appeared in great numbers, probably originated elsewhere. In the years when migrants from the south are not abundant in Great South Bay, fish of Hudson River origin may be the principal source of supply. On the other hand, Raney *et al.* (1954), after examining 792 tag returns from 9,320 striped bass marked in the years 1948 through 1952, concluded that Hudson River stock did "not often go further east along the south shore of Long Island than Jones Beach". However, since the amount of fishing for striped bass in Great South Bay was negligible, tag

TABLE 7. RELATION OF RETURNS FROM HUDSON RIVER TO TOTAL RETURNS FROM NEW YORK FOR STRIPED BASS TAGGED IN GREAT SOUTH BAY

Year	Number tagged	Total returns	Returns from New York		
			Total	From Hudson River	
				Number	Per cent
1956	34	6	6	1	16.6
1959	69	29	22	4	18.1
1960-1961	1,814	246	149	3	2.0
1960–1961	1,814	246	149	11*	7.4*

* Includes all New York Harbor, Jamaica Bay and western Long Island Sound.

returns were unlikely. It is of interest that during the present study considerable numbers of striped bass from Great South Bay were captured, either in the year of tagging or subsequent years, in the bay area behind the barrier beach on which Jones Beach State Park is located. This locale, herein designated as the "causeway area" (Figure 2), is a 3-mile-wide sector of bay channels and salt marsh islands bounded by two long causeways and their supporting bridges which connect the mainland of Long Island to Jones Beach. It lies 20 to 25 miles west of the tagging sites in Great South Bay. It may be speculative to attribute to Hudson River origins that portion of the striped bass population of Great South Bay that moved westward to the causeway area, but such a separation of stock of mixed origin is entirely possible.

In an effort to learn more about the relationship, if any, of striped bass in Great South Bay to Hudson River fish, all available tagging records for the Hudson River were reviewed. There was no evidence that the river stock reaches the south shore of Long Island to any appreciable extent, except in the vicinity of New York City. Neville (1940) reported that a few striped bass tagged off South Nyack were recovered near the George Washington Bridge within 4 days after release. Subsequent returns from the 200 bass tagged that year (1940) did not include any recoveries from outside the Hudson River or its downstream New York Harbor terminus. These and other data for the 504 striped bass tagged in the Hudson River in the years between 1940 and 1956 are summarized in Table 8. The number tagged in any one year was small, and the tagging was sporadic. Also, most of the fish were sub-legal in size at the time of tagging which in itself would affect tag returns. In addition, it is well established that small striped bass, particularly those less than 2 years old, are relatively nonmigratory. Vladykov and Wallace (1938, 1952), Merriman (1941), Raney (1952, 1957), Mansueti (1961), and Massmann and Pacheco

Table 8. Summary of Records for Striped Bass Tagged in the Hudson River, 1940–1956

Year	Season and location	Fish tagged*§					Recoveries	
		Size (inches)			Legal size			
		Number	Range	Mean	Number	Per cent	Number	Per cent
1940	April 9–17	200	7–16	?	?	..	72†	36.0
	South Nyack	(100)						
	Piermont	(100)						
1942	July 22	20	5–12	?	0	0	0	0.0
	Haverstraw	(20)						
	Sub-total	220	5–16	..	..	..	72	32.7
1954	June 11–November 1	108	6–20	8.6	1	0.9	0	0.0
	Stockport	(96)						
	Croton	(10)						
	Coxsackie	(1)						
	Newburg	(1)						
1955	March 1–September 21	28	5.75–29	15.1	12	42.9	1‡	3.6
	Croton	(15)						
	Stockport	(7)						
	Mill State Park	(6)						
1956	April 26–October 23	148	8–37	15.9	44	29.7	9#	6.1
	Croton	(148)						
	Sub-total	248	5.75–37		57	20.1	10	4.0
Total		504	5–37	..	..	..	82	16.2

* In 1940, 1954 and 1956 the fish tagged were taken by seining; in 1942 by angling; in 1955 by trap netting.

§ Of the fish marked in 1954, 45 were tagged with Petersen disc tags, 57 with jaw tags and 6 were doubled tagged; the figures were 20, 4 and 4, respectively, in 1955; and 136, 12 and 0 in 1956.

† From Hudson River, one or two south to New York Harbor.

‡ From Hudson River at Englewood (N. J.) boat basin.

From Hudson River (7), New York Harbor (1) and Jamaica Bay (1).

(1961) have all commented on the non-migratory behavior of small striped bass and their tendency to remain in or near restricted river systems. The latter two investigators reported that as high as 98 per cent of recaptures were within the river system in which they were tagged. Of 82 returns (16.2 per cent) from the 504 tagged bass, none came from beyond New York Harbor and adjacent Jamaica Bay.

In an earlier report, Raney *et al.* (1954) analyzed returns from angler-tagged striped bass and reported that none of those released in the Hudson River was recaptured outside its waters. Further, of 133 recoveries of bass tagged at the Narrows and in Upper and Lower

New York Bays, all but three (2.3 per cent) were from the Hudson River. These were small-sized fish. Although the individual lengths were not reported, 95 per cent were 16 inches or less in length, and most were between 9 and 15 inches. It seems obvious that further work with substantial numbers of mature fish will be required to describe the range, migrations and population dynamics of striped bass that frequent the Hudson River.

If, however, most of the striped bass in Great South Bay did not originate from Hudson River stock, what was their probable origin? The relative paucity of returns from Chesapeake Bay, the center of striped bass abundance on the East Coast, and the only slightly greater number from Delaware Bay (Tables 3 and 9) make it difficult to assign these areas as points of origin. Vladykov and Wallace (1938, 1952) showed that only very small numbers of striped bass tagged in Chesapeake Bay were recaptured outside the bay. Only 28 (1.5 per cent) of 1,869 fish tagged in the Middle Chesapeake area were recaptured along the Atlantic coast north of Chesapeake Bay. They believed that this low recapture rate was partially due to the intensive fisheries which reduced the number of tagged fish before they started to leave Chesapeake Bay, and they estimated that migrants amounted to about 30 fish out of 1,000. Nevertheless, Tiller (1950) presented evidence that striped bass of the dominant 1940 year class, taken at Montauk and Great South Bay in 1942, were of Chesapeake Bay origin. He based his conclusions on an analysis of growth, comparing body lengths and calculated lengths at age I of fish from two locations in Chesapeake Bay with those of the northern specimens. Recent studies involving numbers of striped bass tagged at several different locations in Chesapeake Bay have contributed little to our knowledge of coastwise migrants. Mansueti (1961) reported that less than 1 per cent of 418 tag returns, from 1,103 striped bass released in Maryland's portion of Chesapeake Bay and its tributaries, were recovered outside the bay. Massmann and Pacheco (1961) found a somewhat higher proportion (4.2 per cent) of recoveries outside the bay from fish tagged in Virginia's Chesapeake Bay tributaries. On the other hand, if only large striped bass (6 pounds or heavier) are considered, Chapoton and Sykes (1961) reported that 14 of 27 recaptures, from 206 fish tagged in Chesapeake Bay, were taken along the coast north of the bay. It is probably true, as Mansueti (1961) has stated, that "tagging studies up to now have not yet shown the true relationship between the available population and the migratory segment".

Even less is known about the migratory behavioral patterns of the Delaware Bay populations of striped bass. The species is known to spawn in the Delaware and Maurice Rivers. A number of authors, including Raney and deSylva (1953), Lewis (1957), Lund (1957),

Table 9. Specific Recovery Locations, by Month, for Striped Bass Tagged in Great South Bay, 1956–1961

Month	Location	Number	Remarks
January	New Jersey		
	Ausbury Park	1	tags found on beach
	Harvey Cedars	1	ocean, offshore
	Wildwood	1	ocean, offshore
February	Maryland		
	James Island	1	Chesapeake Bay
	New Jersey		
	Thompsons Beach	1	Delaware Bay
	Dennis Creek	1	Delaware Bay
	Brigantine	1	ocean, offshore
	Barnegat Inlet	1	ocean, offshore
March	Virginia		
	James River	1	Chesapeake Bay
	York River	1	Chesapeake Bay
	Maryland		
	Wicomico River	1	Chesapeake Bay
	Nanticoke River	1	Chesapeake Bay
	Chincoteague Bay	1	
	Delaware		
	Misspillion Light	1	Delaware Bay
	Bower's Beach	1	Delaware Bay
	New Jersey		
	Maurice River	1	Delaware Bay
	East Point	1	Delaware Bay
	Near Wildwood	1	Delaware Bay
	Brigantine Beach	1	
	Mullica River	2	
April	Maryland		
	Nanticoke River	1	Chesapeake Bay
	Delaware		
	Rehoboth Bay	1	
	New Jersey		
	Tuckahoe River	1	
	Great Egg Harbor	1	
	Great Bay	1	
	Mullica River	1	
	Long Beach Island	1	
	Barnegat Inlet	1	ocean, offshore
	Barnegat Inlet	1	
	Barnegat Bay	3	
	New York		
	Hudson River	2	
	Point Lookout (L. I.)	1	
May	New Jersey		
	Barnegat Inlet	1	
	Barnegat Bay	1	
	Seaside Park	1	
	Long Branch	1	
	Atlantic Highlands	1	
	Sandy Hook	1	
	New York		
	Lower New York Bay	1	
	Hudson River	3	

TABLE 9. (*continued*)

Month	Location	Number	Remarks
	Coney Island (L. I.)	1	
	Cold Spring Harbor (L. I.)	1	
	Atlantic Beach (L. I.)	1	
	Island Park (L. I.)	1	
	Jones Inlet (L. I.)	1	
	Jones Beach (L. I.)	2	
	East Bay (L. I.)	6	causeway area
	Great South Bay (L. I.)	10	7 by project seining
	Bellport Bay (L. I.)	3	
	Moriches Inlet (L. I.)	2	
	Amagansett (L. I.)	3	
	Napeague (L. I.)	1	
	Montauk (L. I.)	1	
	Rhode Island		
	Sakonnet Point	1	Block Island Sound
	Barrington	1	Narragansett Bay
	Maine		
	Biddeford Pool	1	
	Sasanoa River (Bath)	1	
June	Delaware		
	Lewes	1	
	New Jersey		
	Barnegat Inlet	2	
	Bay Head Canal	1	
	Sandy Hook	2	
	New York		
	Hudson River	1	
	Rockaway Inlet (L. I.)	1	
	Atlantic Beach (L. I.)	1	
	Jones Beach (L. I.)	1	
	East Bay (L. I.)	7	causeway area
	Gilgo Beach (L. I.)	1	
	Fire Island Inlet (L. I.)	2	
	Great South Bay (L. I.)	16	12 by project seining
	Bellport Bay (L. I.)	3	
	Shinnecock Canal (L. I.)	1	
	Montauk Point (L. I.)	1	
	Connecticut		
	Connecticut River	1	at mouth of river
	Rhode Island		
	Charleston	2	Block Island Sound
	Tiverton	1	Narragansett Bay
	Patience Island	1	Narragansett Bay
	Jamestown	1	Narragansett Bay
	Middletown	1	Narragansett Bay
	East Greenwich Bay	1	Narragansett Bay
	Massachusetts		
	Woods Hole	1	
	Plymouth	1	
	Newburyport	1	
July	New Jersey		
	Point Pleasant	1	
	New York		
	Rockaway Inlet (L. I.)	1	
	Long Beach (L. I.)	1	
	Jones Inlet (L. I.)	1	
	East Bay (L. I.)	5	causeway area

Table 9. *(continued)*

Month	Location	Number	Remarks
	Fire Island Inlet (L. I.)	1	ocean, offshore
	Fire Island Inlet (L. I.)	3	
	Great South Bay (L. I.)	2	by project seining
	Bellport Bay (L. I.)	2	
	Moriches Inlet (L. I.)	3	
	Southampton (L. I.)	1	
	Northwest Harbor (L. I.)	1	Gardiners Bay
	Cartwright Island (L. I.)	1	
	East Marion (L. I.)	1	
	Connecticut		
	Groton	1	
	Stonington	1	
	Rhode Island		
	Newport	1	
	Narragansett Bay	1	
	Massachusetts		
	Fairhaven	1	Buzzards Bay
	Newburyport	1	
August	New Jersey		
	Shrewsbury River	1	
	New York		
	Annadale Beach (S. I.)	1	Lower New York Bay
	The Narrows	1	New York Harbor
	Jamaica Bay (L. I.)	1	
	Rockaway Beach (L. I.)	2	
	Atlantic Beach (L. I.)	2	
	East Rockaway (L. I.)	1	Hempstead Bay
	Massapequa (L. I.)	1	South Oyster Bay
	East Bay (L. I.)	2	causeway area
	Cedar Beach (L. I.)	1	
	Great South Bay (L. I.)	8	6 by project seining
	Bellport Bay (L. I.)	3	
	Fire Island (L. I.)	1	
	Montauk (L. I.)	2	
	Fisher's Island	1	
	Connecticut		
	Niantic River	1	
	Massachusetts		
	Cuttyhunk	1	
	Maine		
	Scarboro	1	
September	Massachusetts		
	Buzzards Bay	1	
	Rhode Island		
	Greenwich Bay	1	Narragansett Bay
	Connecticut		
	Old Saybrook	1	
	New York		
	Montauk (L. I.)	1	
	Moriches Inlet (L. I.)	1	
	Fire Island Inlet (L. I.)	1	
	Great South Bay (L. I.)	4	1 by project seining
	East Bay (L. I.)	1	causeway area
	Atlantic Beach (L. I.)	1	
	Rockaway Inlet (L. I.)	1	
	Jamaica Bay (L. I.)	1	

TABLE 9. (*continued*)

Month	Location	Number	Remarks
October	Massachusetts		
	Chatham Inlet	1	Cape Cod
	Buzzards Bay	1	
	Cuttyhunk	1	
	Rhode Island		
	Barrington River	1	Narragansett Bay
	New York		
	Montauk (L. I.)	1	
	Shinnecock Inlet (L. I.)	1	
	Moriches Inlet (L. I.)	1	ocean, offshore
	Smith Point (L. I.)	2	Narrow Bay
	Fire Island (L. I.)	3	
	Great South Bay (L. I.)	3	1 by project seining
	Gilgo Beach (L. I.)	1	
	Jones Inlet (L. I.)	1	
	East Bay (L. I.)	4	causeway area
	Atlantic Beach (L. I.)	1	
	East Rockaway Inlet (L. I.)	1	ocean, offshore
	Rockaway Beach (L. I.)	2	
	Jamaica Bay (L. I.)	2	
	Lower New York Bay	1	
November	New York		
	Amagansett (L. I.)	1	
	Smith Point Park (L. I.)	1	Fire Island
	Point O'Woods, Fire Island (L. I.)	1	ocean, offshore
	Jones Beach (L. I.)	1	ocean, offshore
	Jones Inlet (L. I.)	1	
	Long Beach (L. I.)	2	ocean, offshore
	Hudson River	1	Nyack
	New Jersey		
	Sandy Hook	1	ocean, offshore
	Monmouth Beach	2	
	Asbury Park	1	
	Belmar	1	
	Spring Lake	1	
	Sea Girt	1	
	Point Pleasant	1	ocean, offshore
	Point Pleasant Beach	1	
	Bay Head	2	
	Seaside Park	1	
	Barnegat Inlet	2	ocean, offshore
	Brant Beach	1	
	Near Wildwood	1	Delaware Bay
	Maryland		
	Chesapeake Bay Bridge	1	
	Virginia		
	York River	1	Chesapeake Bay
December	New York		
	Hudson River	1	Ossining
	New Jersey		
	Island Beach State Park	2	
	Harvey Cedars	1	ocean, offshore
	Mullica River	1	

Murawski (1958) and deSylva (1961), have made meristic and morphometric studies of Delaware Bay fish and have concluded that these striped bass are a separate population. But the size of the population and its contribution to striped bass stocks elsewhere on the Atlantic coast are unknown. Maltezos (1960) concluded, on the basis of meristic counts, that part of the population of striped bass of the Connecticut and Niantic Rivers was derived from Delaware Bay stock. Some fish tagged in Connecticut were recovered along the south shore of Long Island as well as southward to Delaware and Chesapeake Bays.

The following explanation is offered as an hypothesis to explain why additional returns were not received from Chesapeake Bay, the probable source of the majority of the striped bass of Great South Bay. Most of the bass in Great South Bay were small. Their length-frequency distribution (Table 6) shows that at least 70 per cent were less than 17 inches (432 millimeters) in fork length and almost 80 per cent were less than 18 inches (457 millimeters). If they were also predominantly females most would have been immature. Merriman (1941) found that about 25 per cent of the female striped bass he examined from Connecticut waters first spawned just as they were becoming 4 years old (mean length 17.7 inches), that about 75 per cent were mature as they reached 5 years of age (20.9 inches) and that 95 per cent had attained maturity by the time they were 6 years old (24.0 inches). Vladykov and Wallace (1952) reported that no female less than 17 inches long was mature among their Chesapeake Bay collections, and only 25 per cent between 17 and 18 inches had reached maturity. Only two reports are available on the sex ratio of striped bass in the vicinity of New York. Merriman (1941) determined that only 9.7 per cent of 676 specimens from Long Island and southern New England were males, and Alperin (1965) found 14.2 per cent to be males among 775 collected along the outer beaches of Long Island. Therefore, since most of the striped bass in Great South Bay were less than 17 inches long, and assuming that they were preponderantly females, this population could be described as basically immature. These fish, then, would not necessarily be involved in spawning runs in the spring after tagging and perhaps not for several years. In the intervening time many would be recaptured, some would lose their tags, and a large percentage (estimated by Sykes *et al.* (1961) to be as high or higher than known fishing mortality rates of 40 to 45 per cent per year) would die of natural causes before they could return to their "home" grounds in tributaries of Chesapeake Bay.

This theory is not entirely new, for Merriman (1941) proposed a similar pattern of behavior to account for the spring coastal migration of striped bass. He correlated it with size (age) and sexual maturity

and commented on the appearance of a vanguard of immature females in April and May followed by postspawning mature females. Merriman presented several kinds of evidence to support his contention that the myriad small bass present on the coast north of Chesapeake Bay in 1936 and 1937 were derived from the dominant 1934 year class which originated in Chesapeake Bay. The data of Chapoton and Sykes (1961) on the recapture of large postspawning striped bass along the mid-Atlantic and New England coasts lends support to the latter part of Merriman's supposition.

Seasonal Distribution

The seasonal distribution of striped bass in Great South Bay is quite compatable with that described for the Northeast by other authors (Merriman, 1941; Raney, 1952; Raney *et al.*, 1954). Striped bass are known to winter, at times in numbers, from Long Island north to Massachusetts. Most of the records, however, of wintering fish in New York refer to the Hudson River and the bays along the north shore of Long Island (Neville *et al.*, 1939; Neville, 1940; Raney, 1952), but commercial catches have been made in midwinter in the south shore bays as well. There are very local wintertime recreational fisheries in both north and south shore bays, and at least one operates within the area where tagging was done in Great South Bay. Nevertheless, there is little evidence that the tagged fish wintered north of New Jersey. There was but one winter record from the Hudson River and most of the others were from New Jersey, the greatest number coming from Barnegat Inlet south to Delaware Bay. Other wintering fish were recovered in Maryland and Virginia, but the number was small.

Most of the spring records were from New Jersey and Long Island, the fish moving progressively northward with the season, and there was evidence of early migration into New England waters (as far north as central coastal Maine) during this period. With the advent of summer, returns were concentrated at Long Island with a number of recaptures from New England, again including Maine. At this season, records from south of New York were negligible—a few from New Jersey and none from the Delaware or Chesapeake Bay areas. During the fall the tagged fish exhibited a broad coastal distribution, with evident movement from north to south as the season progressed. Again, most of the records were from Long Island waters and along the New Jersey coast as they were in the spring, but the area involved extended from Massachusetts to Virginia.

This distributional pattern was repeated in each year in which recoveries were made, and, although the numbers taken at either end

of the range were few, it is evident that the coastal movement was similar to that described for striped bass tagged in Connecticut and eastern Long Island by Merriman (1941) and others. Without citing the individual recoveries (Table 9), it is possible to outline the seasonal distribution and migration. In the winter (December 22–March 21) the fish were present from Barnegat Inlet (New Jersey) to Chesapeake Bay. In the spring (March 22–June 21) they moved northward to northern New Jersey, Long Island (but not into Long Island Sound) and New England. They summered principally in Long Island and New England waters. In the fall (September 23–December 21) they were found from Massachusetts to as far south as Virginia, but most of those recaptured were taken in Long Island and northern New Jersey waters. As winter approached the fish were again found mainly along the coast from central and southern New Jersey south to Delaware and Chesapeake Bays and their tributary streams. That some of these fish frequented the Hudson River was indicated by one record in winter, five in spring and one in fall.

Dispersal from Great South Bay

The movements of striped bass tagged in Great South Bay, during the weeks and months immediately after tagging, appear to have been quite random. There were many instances of dispersal over a wide geographic area of fish that had originally been taken from a single school or, at least, at the same time.

For example, a successful haul at Hyde's Canal at West Islip on May 11, 1960 resulted in the tagging of 362 striped bass, 22 of which were recaptured during 1960. In the same month in which they were tagged, recoveries were made as far apart as Sakonnet Point (Rhode Island) and Sandy Hook (New Jersey). Others were taken at this time at several locations in Great South Bay within a few miles of the tagging site and at Amagansett and Napeague to the east and Jones Beach and the causeway area to the west of Great South Bay, as well as at Ossining on the lower Hudson River. In June the fish were just as widely distributed with returns ranging from Narragansett Bay and Charleston in Rhode Island to Barnegat Inlet in New Jersey. In Long Island waters they were taken at various points along the south shore from Montauk Point to Rockaway Inlet.

Similar random dispersal was noted for fish tagged in 1961. Within 2 months after a group were tagged near Bayport on June 13 there were recoveries at Newburyport (Massachusetts), Narragansett Bay (Rhode Island), Southampton and Moriches Inlet (eastern Long Island), the causeway area and Jamaica Bay (western Long Island) as well as in the vicinity of the tagging site and at Fire Island Inlet

The only generalization that can be made concerning this dispersal is that fish tagged in May were more frequently recovered in New England than those tagged in June. More of the latter were recaptured in Long Island waters during the first weeks after tagging. This could be interpreted to mean that the earliest arrivals in Great South Bay have more of a tendency to migrate farther to the eastward and northward.

Distribution of Tag Returns from New York Waters

Since almost all the marine waters of Long Island and southern New York contain striped bass at one season or another, it is pertinent, with respect to the State's striped bass fishery, to correlate the tag returns with the various areas involved. Although the intensity of sport and commercial striped bass fishing pressure for any particular area is largely unmeasured, except for the surf area between Jones and Shinnecock Inlets (Briggs, 1965), some measure of it, as it applies to fish that disperse from Great South Bay, may be found in the distribution of the specimens recovered.

There were 149 recoveries of tagged fish from New York waters. All but one of these were used to plot an east-west distribution related to geographically selected fishing areas known to harbor striped bass. Waters west of the Nassau-Suffolk County boundary, on both the north and south shores of Long Island and including all of New York Harbor, Staten Island and the Hudson River, were designated the western sector. All waters east of this boundary were designated the eastern sector. Although this divided the Marine District unequally, a lack of recoveries between South Oyster Bay and the Captree area of Great South Bay provided a convenient region of separation. Combined tag returns from the commercial and sport fisheries totaled 84 (56.8 per cent) from the eastern sector and 64 (43.2 per cent) from the western sector. Within these broad designations some subareas produced many more returns than others in proportion to the known fishable waters.

Outstanding in the western sector was the causeway area which produced 29 (19.6 per cent) of the returns for the State. This area which is comprised essentially of East Bay and Jones Bay (inside Jones Inlet) is a mere 3 to 3½ square miles in size. Farther west the more extensive area from the western side of Jones Inlet to Jamaica Bay (essentially all of Hempstead Bay) produced 24 (16.2 per cent) of the recoveries. This area includes about 21 miles of ocean beachfront for surf and troll fishing and 84 square miles of bay environment. In contrast, the remainder of the sector furnished but 11 (7.4 per cent) of the tag returns although it includes more than 300 square miles of striped bass environment.

In the western sector then, it appears that the relatively narrow confines of East Bay, where fishing pressure was heavy under the Jones Beach causeway bridges and in the adjacent boat channels (all within 20 to 25 miles of the tagging sites), produced a disproportionately large number of returns from the striped bass that were tagged in Great South Bay in May and June of 1960 and 1961. Whether these fish first entered Great South Bay via Jones Inlet or Fire Island Inlet is unknown. In the former case they may merely have returned, either through the bay complex or along the outer beaches, to a more favorable deep-water environment under the causeway bridges after a brief seasonal exploration of the more shallow expanses of Great South Bay. Some bass, as shown by scattered tag returns and recoveries by project seining, remained in Great South Bay, but either their numbers were not substantial or they were hard to locate. Also, numbers of bass moved westward to the causeway area (and beyond), and some were recaptured there within days after tagging and throughout the ensuing summer and fall. Additional recoveries were made there two or more years later. The causeway area produced 2.4 tag returns per square mile, the area from Point Lookout (Jones Inlet) to Rockaway Point (entrance to Jamaica Bay) 0.3 per square mile, Jamaica Bay 0.1 per square mile, New York Harbor and environs 0.02 per square mile, and the Hudson River and western Long Island Sound 0.05 per linear mile.

No such concentration of recoveries as that at East Bay occurred in the more extensive eastern sector even though it included the tagging areas. From Great South Bay (including the Suffolk County portion of South Oyster Bay) there were 19 (12.8 per cent) scattered returns. An additional 17 recaptures resulted from project seining, mostly within a short period after the tagging but several in subsequent years, bringing the total recovery rate to 24.3 per cent. It is this relatively high total return that encourages efforts to establish a sport fishery for striped bass within Great South Bay itself. However, the rate of return was only 0.1 per square mile from the Suffolk County boundary to Smith Point, representing a total area of about 140 square miles plus an additional 31 miles of barrier beach.

The most easterly section of Long Island is famous for its striped bass fishing both from the beaches and by trolling. It is also most intensively fished by commercial interests and is the center of the surf haul seine fishery. But the area is vast, including about 59 miles of ocean beach frontage and 78 square miles of bay environment from Smith Point to Montauk Point together with an additional 180 square miles of bay involving the Gardiners Bay-Peconic Bays complex. Moriches Inlet, Shinnecock Inlet and the extreme eastern portion of this area are most intensively fished, and, although returns were

scattered throughout this region, the eastern end was the most productive. There were 48 (32.4 per cent) of the total tag returns for the State from this area (including one from Fisher's Island about 16 miles farther east). Even though the area has about twice the amount of bay and estuarine environment and of ocean frontage, the recovery rate of 0.2 per square mile was double that for Great South Bay. This area lies directly along the route of all striped bass traveling northward to summer in New England waters, and any fish from Great South Bay must pass through, either by way of the bays or along the outer beaches. In either case, they are subject to intensive fishing pressure. This probably accounts for the fact that on the whole more striped bass were recovered from the eastern than from the western parts of this sector.

Establishment of a Striped Bass Fishery in Great South Bay

If the 1960 and 1961 seasons are indicative, there may be a sizable spring population of striped bass in Great South Bay during some years. It would perhaps require annual exploratory seining to determine the regularity of this condition. Nevertheless, in these years, the fish were apparently abundant enough to have supported a sport fishery in May and June. During some periods, at least, as high as 50 per cent or more of the catch were of legal size under present regulations. However, the fish rarely exceeded 600 millimeters in fork length, and they appeared to represent relatively few year classes. This may mean that a sustained seasonal fishery and angler success would be dependent on year class recruitment when the fish reached legal size at about age III or IV.

It is unlikely that the striped bass of Great South Bay, in years of abundance, are of Hudson River origin. Rather they appear to be part of the coastwise migratory population that originates to the southward, either in the Chesapeake or Delaware Bay area. There is no meristic data to support this assumption, but tag returns do not exclude this probability. Whether a competitive fishery in Great South Bay would materially effect the catch of striped bass in the causeway area is unknown.

Development in Great South Bay of a sport fishery for striped bass would require considerable exploratory fishing on the part of skilled anglers. It's success would depend not only on the annual appearance of quantities of bass but also on the assurance of continued accessability and the development of fishing facilities, such as public small-craft-launching sites, and techniques for shallow-water fishing. A similar spring fishery, of considerable magnitude, has existed for years in the Barnegat Bay region of New Jersey. Many new light-

tackle techniques (see, for example, McLain, 1964) have been developed to locate and exploit the presence of large numbers of striped bass in shallow water. In many respects the environment of Great South Bay is comparable.

To encourage the development of a substantial sport fishery in Great South Bay and to take advantage of the presence of small fish resulting from dominant year classes, modification of the size limit might be considered for this area. The striped bass found there are predominantly of non-spawning age, and they are of highly migratory stock which in years of abundance probably originates largely outside the State. Many are quickly lost to our fisheries through dispersal and further migration. In the present study, if a size limit of 12 inches in fork length were used, the population sampled would have been composed of 314 (16.4 per cent) sublegal and 1,603 (83.6 per cent) legal-sized fish. Under current regulations, the undersized bass numbered 1,186 (61.9 per cent) while legal fish totaled 771 (38.1 per cent). Reducing the size limit by 4 inches would more than double the potential retainable catch. In both Chesapeake and Delaware Bays, the probable origin of these fish, the minimum size limit is 12 inches in total length.

The number of salt-water anglers is increasing at a rapid pace. Crossley, S-D Surveys, Inc. (1956) estimated that there were 608,000 in New York in 1955. Stroud (1963) reported the average annual increase to be about 6.7 per cent. By extrapolation, there would have been about 1,163,000 at the end of 1965. At the same time, fishing access and the stocks of many estuarine species are diminished or threatened. This has not been true of striped bass. In modern times, dominant year classes have occurred with more and more regularity. Mansueti (1962) and Mansueti and Hollis (1963) cited those of 1934, 1940, 1942, 1943, 1946, 1948, 1950, 1954, 1956, 1958, 1961 and 1962. Based on an 11-year index of abundance of young-of-the-year fish, Hollis (personal communication) reported that the 1964 year class in Maryland was expected "to match or exceed those of 1956 and 1958". With successful year classes recorded as frequently as every two or three years, on the average, the potential for a sustained fishery in Great South Bay is enhanced.

CONCLUSIONS

In years when the population of striped bass in Great South Bay is low, a substantial proportion of those present may be of Hudson River origin. But when the species is abundant, it seems probable that most of the fish come from the Delaware Bay-Chesapeake Bay region and represent dominant year classes spawned there. On such

occasions, young fish predominate and, at times, about half may have reached legal size. Furthermore, they are present primarily during May and June, after which they disperse widely. There is reason to believe that a sport fishery might be developed in Great South Bay to harvest these fish, particularly if the size limit there were reduced.

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OCCURRENCE OF YEARLING STRIPED BASS ALONG THE SOUTH SHORE OF LONG ISLAND[1]

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ABSTRACT

Yearling striped bass are rarely encountered along the northeastern Atlantic coast because fish of this species characteristically do not migrate far from their spawning grounds before reaching 2 years of age. In June and July of 1964, schools of yearling striped bass appeared at several locations along the south shore of Long Island where they frequented fresh water environments. Several specimens that were collected proved through meristic character analysis to be most closely related to Hudson River stock, and this was presumed to have been their origin. The presence of these yearlings can in no way be construed to have represented local spawning.

In his classic account of the striped bass *(Roccus saxatilis),* Merriman (1941) pointed out the absence of juvenile and yearling bass along the Atlantic coast. The smallest and youngest fish he encountered in Connecticut waters was a 2-year-old specimen measuring 23 centimeters. Merriman further stated that, among thousands of striped bass examined in northern coastal waters (Maine to Delaware), individuals less than 2 years old were rarely encountered. Later, Raney (1952), in reviewing what was known of the life history of the species, reported that young were extremely scarce in Long Island waters and mentioned only a single 3-inch specimen collected on August 5, 1938 at Bayside. This area of Little Neck Bay is actually within the boundaries of New York City at the extreme western end of Long Island Sound. Tagging studies (Raney *et al.*, 1954) have shown that the striped bass of western Long Island Sound are probably of Hudson River origin so that it would not be unusual to encounter some very small bass in this general area. Curran and Ries (1937) collected numerous juveniles in the Hudson River between July 3 and September 1 in 1936, and Merriman (1941) presented a length-frequency distribution for 628 of these fish. The largest measured 107 millimeters, and there were only four specimens (0.64 per cent) more than 100 millimeters in fork length. According to Merriman, juveniles from the Hudson River averaged 5 to 7 centimeters in length by midsummer, while juveniles taken in Delaware Bay in November (1937) were from 9.5 to 12.5 centimers long, and 1-year-old specimens averaged 11 to 12 centimeters in length the following spring. Six yearlings taken in the Hudson River during July and August in 1936 and 1937 averaged 14.3 centimeters (range 12.0 to 15.9 centimeters), while yearlings in the Delaware Bay region in November 1937 averaged 19 centimeters.

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HISTORY

In recent years juvenile and yearling striped bass have been very scarce or entirely absent in most areas of the Marine District of New York, except in those waters near New York City where the downstream influence of the Hudson River, which has been shown to harbor quantities of these fish, is felt. Apart from the records reported here, no yearling striped bass have been encountered, since 1951 at least, in the various netting operations by the Bureau of Marine Fisheries personnel, except in Jamaica Bay and the waters of Lower New York Bay. These areas, in effect, may be considered the lower estuary of the Hudson River, and some small bass might be expected to work downstream that far. During the biological survey of the salt waters of Long Island in 1938, Greeley (1939b) recorded only one juvenile at Bayside (the same specimen cited by Raney [1952]) and two larger specimens "377 millimeters and 13 inches (approximately)" in Great South Bay. Neville *et al.* (1939) reported that "young fish tows in the bays together with seine collections in streams disclosed no specimen" of striped bass. At the same time none was encountered in any pond or stream on Long Island, Shelter Island or Staten Island (Greeley, 1939a). Among 1,917 striped bass seined in Great South Bay from 1956 through 1961 (Alperin, 1966) no specimen less than 200 millimeters in fork length was captured and only five (0.26 per cent) between 200 and 250 millimeters were taken. The latter were all probably small age II fish.

OCCURRENCE OF YEARLINGS

On June 30, 1964 a yearling striped bass was collected from the Swan River (at East Patchogue), a stream which empties into the eastern part of Great South Bay. This specimen was one of many of similar size taken by angling from schools of small bass encountered by trout fishermen in the stream just above tidewater. About the same time, numbers of striped bass ranging from 125 to 150 millimeters long, approximately, were captured by anglers in the Carll River (near Babylon), although specimens were not obtained for study. This stream enters Great South Bay toward its western end. At this location the small bass were prevented from working upstream and out of the brackish water by a man-made falls where the outlet of Argyle Pond empties into the Carll River estuary.

About two weeks later, on July 15 and 17, three small striped bass were captured by angling by Department personnel during a limnological investigation of Doxey Pond at Woodmere. A large school of small bass was present, but no gear was available at the time to secure additional specimens. Doxey Pond (in reality a series of three man-

made ponds) interrupts a meandering natural stream (Mott Creek) that drains into the headwaters of Jamaica Bay. The lowest pond, which contained the striped bass, was separated from the brackish bay waters by an effective tide gate which kept the pond fresh.

In addition to these records for the south shore of Long Island proper, four bass of similar size had been seined at Lemon Creek on July 9, 1958. This is a small stream that enters Princess Bay on the southeastern shore of Staten Island at the mouth of the Hudson River.

These fish were considered to have been yearlings, and certain meristic characteristics of the specimens collected are shown in Table 1. All exhibited a well defined scale annulus and an additional growth increment, except for the smallest bass from Doxey Pond. The latter may have had an annulus forming on the scale margin and, because of its size and the time of the year it was collected, must also have been a yearling.

Rathjen and Miller (1957), who examined hundreds of juvenile striped bass from the Hudson River, did not report young of this size until late in the period of August 9 to September 5 and at that time collected only one such specimen. The maximum size of age 0 specimens collected by these investigators in the period between July 12 and August 8 was only 74 millimeters in fork length, well below the size of the yearlings shown in Table 1. Merriman (1941) reported the average length of 1-year-old striped bass to be 125 millimeters, while among the 628 juveniles collected in the Hudson River between July 3 and September 1 in 1936 the largest was only 107 millimeters. For Chesapeake Bay, Mansueti (1961) gave the average fork length of

TABLE 1. SIZE AND CERTAIN MERISTIC CHARACTERISTICS OF YEARLING STRIPED BASS FROM LONG ISLAND AND STATEN ISLAND

Location	Date	Fork length (millimeters)	Number of spines and fin rays			
			Dorsals		Anal	Pectorals*
			First	Second		
Lemon Creek	July 9, 1958	114	X	I–11	III–11	17–16
		118	IX	I–10	III–10	16–16
		120	X	I–11	III–10	15–15
		134	IX	I–11	III–11	16–16
Doxey Pond	July 15, 1964	110	IX	I–12	III–11	15–16
	July 15, 1964	132	IX	I–11	III–11	15–15
	July 17, 1964	171	IX	I–12	III–11	16–16
Swan River	June 30, 1964	142	IX	I–12	III–11	15–15

* Number of rays in each pectoral fin given separately.

age I fish as 135 millimeters for males and 125 millimeters for females. These data confirm the conclusion that all striped bass from the south shore waters of Long Island, collected in late spring and early summer and ranging in length from about 100 to 175 millimeters, were yearlings and did not reflect local spawning. Only the presence of eggs, larvae and/or numbers of age 0 fish would constitute evidence that small striped bass from Long Island were the product of spawning in the streams in which they were encountered. No such evidence is known.

RACIAL ORIGINS

Using the methods of Raney and deSylva (1953) and Raney (1957), fin-ray counts were made of the specimens collected in 1958 and 1964 (Table 2). Although the sample size was inadequate, the following observations can be made.

Counts of the spines in the first dorsal fin were high compared with those for striped bass of the 1954 year class taken at various locations in the Hudson River as given by Raney (1957). The mean

Table 2. Distribution, According to the Number of Spines and Rays in Certain Fins, of Yearling Striped Bass from Long Island and Staten Island

Item	Lemon Creek (4 specimens)	Doxey Pond (3 specimens)	Swan River (1 specimen)	Total
First dorsal fin				
9 spines	2	3	1	6
10 spines	2	..	..	2
Mean spines	9.50	9.00	9.00	9.25
Second dorsal fin				
10 soft rays	1	..	..	1
11 soft rays	3	1	..	4
12 soft rays	..	2	1	3
Mean rays	10.75	11.67	12.00	11.25
Anal fin				
10 soft rays	2	..	..	2
11 soft rays	2	3	1	6
Mean rays	10.50	11.00	11.00	10.75
Pectoral fins*				
30 soft rays	1	1	1	3
31 soft rays	..	1	..	1
32 soft rays	2	1	..	3
33 soft rays	1	..	..	1
Mean rays	31.75	31.00	30.00	31.25

* Both fins combined.

for 1,480 specimens from the Hudson was 9.11, and the highest average was 9.18 for 76 specimens from Staatsburg. The mean of 9.25 for the Long Island and Staten Island specimens was closest to that for the James River in Virginia where the mean was 9.28 for 320 specimens of the 1955 year class. Raney mentioned that counts for young striped bass of the James River system averaged high among those for fish from various tributaries of Chesapeake Bay and, when compared with data for parts of the Atlantic coast, were approached only by values for specimens from the Hudson River.

The mean (11.25) for counts of the soft rays in the second dorsal fin was intermediate when compared with Raney's figures. A sample of 465 young bass from an upstream section of the Hudson River (Coxsackie to Beacon) had a mean count of 11.14, while a sample of 1,021 fish from a downstream section (Peakskill to the Palisades) had a mean count of 11.33. Values for Chesapeake Bay specimens were much higher being 11.74 for eastern shore tributaries, 11.89 for western shore tributaries and 11.53 for the James River.

The mean (10.75) for counts of the anal soft rays was higher than those for upstream (10.49) and downstream (10.61) samples from the 1954 year class in the Hudson River, but it was intermediate when compared with that for Hudson River fish of the 1953 year class. In a sample of 64 fish from Coxsackie the mean was 10.55, while for 70 fish from Harverstraw it averaged 10.79. Except for samples from the James River, specimens from Chesapeake Bay had higher means, i.e., 10.90 for eastern shore tributaries and 10.96 for western shore tributaries. For the James River the mean was 10.74.

Raney compared data for the dorsal and anal fins of young striped bass of the 1954 year class from the Hudson River and the James River. His mean counts, together with the corresponding values for the specimens from Long Island and Staten Island are given in Table 3.

According to Raney and deSylva (1953) pectoral ray counts were the best single criterion of racial differences and were higher for

TABLE 3. MEAN FIN-RAY COUNTS FOR YEARLING STRIPED BASS FROM THE HUDSON RIVER, THE JAMES RIVER AND LONG ISLAND AND STATEN ISLAND

Item	Hudson River*	James River*	Long Island and Staten Island
Spines in first dorsal fin	9.11	9.36	9.25
Soft rays in second dorsal fin	11.27	11.53	11.25
Soft rays in anal fin	10.57	10.72	10.75

* After Raney (1957).

fish from Chesapeake Bay than for specimens from the Hudson River. The mean (32.2, range 28–35) for 236 fish collected in the Hudson River between 1936 and 1950 was higher than that (31.25) for yearlings from Long Island and Staten Island (Table 2). Among Chesapeake Bay samples, 231 fish collected between 1897 and 1949 had a mean count of 33.9. These authors concluded that samples of striped bass averaging 33 or more pectoral rays were of Chesapeake Bay origin and that those averaging less than that were of Hudson River origin. Only one of the eight yearlings from Long Island and Staten Island had a count above 32.

Raney and deSylva also developed a character index constituting the sum of the soft rays of the dorsal, anal and both pectoral fins for each specimen and concluded that this was a practical means of separating Hudson River stock from Chesapeake Bay stock. They decided that a line between index values of 55 and 56 gave the maximum degree of separation. The distribution of the specimens from Long Island and Staten Island, according to this index, is given

Table 4. Distribution, According to Character Index, of Yearling Striped Bass from Long Island and Staten Island

Location	Number of specimens	Character index					Mean
		51	52	53	54	55	
Lemon Creek	4	1	1	..	1	1	53.00
Doxey Pond	3	..	1	..	1	1	53.67
Swan River	1	..	..	1	..	..	53.00
Total	8	1	2	1	2	2	53.25

in Table 4. All fell in the range of 55 and below, indicating they were of Hudson River stock.

The relationships of the yearling fish from the Marine District of New York was further assessed by a t-test of the difference between the means of the character indices. The results showed a highly significant difference ($t = 5.6$, d.f. $= 236$) between the Long Island-Staten Island ($\bar{x} = 53.3$, $n = 8$) and Chesapeake Bay ($\bar{x} = 56.3$, $n = 230$) populations. But there was no significant difference ($t = 1.3$, d.f. $= 242$) between the Long Island-Staten Island fish and those from the Hudson River ($\bar{x} = 54.0$, $n = 236$).

DISCUSSION AND CONCLUSIONS

Striped bass characteristically do not migrate great distances before

they approach 2 years of age. However, many investigators have demonstrated that younger fish do disperse widely within known spawning and nursery areas, often traveling in large schools. The most notable of these areas on the Atlantic coast north of the Carolinas are Chesapeake Bay and its tributaries, Delaware Bay and the Hudson River. The presence of "fingerling" striped bass in other localities has frequently given rise to rumors and speculation concerning the possibility of significant spawning success in waters where ovulating fish, eggs and larvae have never been recorded. Nevertheless, the results of the coastal surveys by Wallace and Neville (1942) which substantiated the foregoing principle areas are still considered to be valid.

In other localities, such as within the south shore bays of Long Island, where laymen from time to time report striped bass as spawning, it would be unusual to find yearling or younger fish. This was not the case in 1964, however, when considerable numbers of yearlings were recorded at stream sites along these bays.

The significance of the presence of such small bass in the fresh water sections of these tidal streams is unaccountable within our present state of knowledge. It may have been associated with environmental disturbances of which we are not yet aware, or it may merely have been a result of excessive population density in the more commonly used areas.

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GENERAL NOTES

A NEW PARASITE OF STRIPED BASS[1]

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In the summers of 1958 and 1964, eight yearling striped bass (*Roccus saxatilis*) were collected from the fresh-water sections of three tidal streams on the south shore of Long Island and Staten Island (Alperin, 1966). All were infested with the parasitic mouth and gill isopod *Livonica ovalis*, 10 of which were extracted from the eight specimens. The parasites were all attached inside the operculum; none was located on the roof of the mouth or in the buccal cavity. They ranged from 12.5 to 19.0 millimeters in length. Three of the fish, one from each stream, together

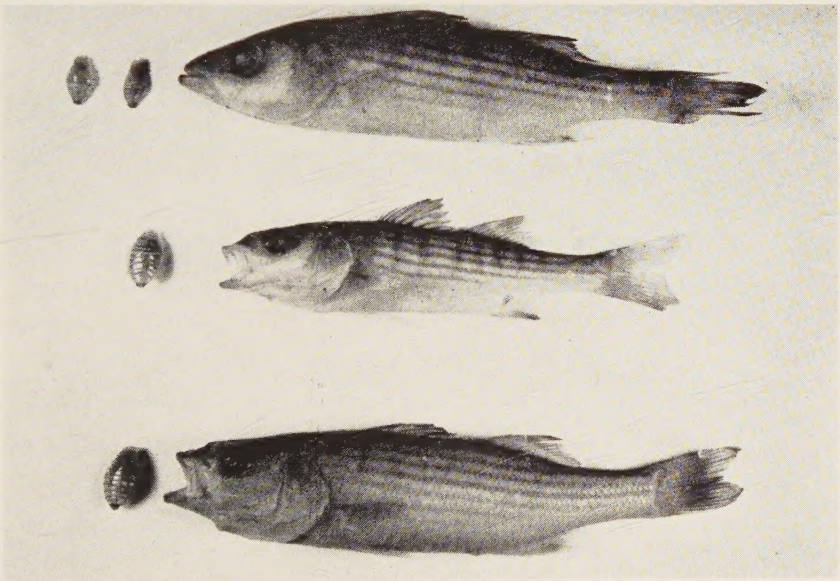

Figure 1. Yearling striped bass parasitized by *Livonica ovalis* and parasites found in each.

Top —142 millimeters fork length, collected June 30, 1964 from Swan River at East Patchogue on Long Island.

Center —110 millimeters fork length, collected June 17, 1964 from Doxey Pond at Woodmere on Long Island.

Bottom—134 millimeters fork length, collected July 9, 1958 from Lemon Creek at Princess Bay on Staten Island.

with the parasites found in each, are shown in Figure 1. There was little relationship between the size of a fish and that of the parasites found in it.

Livonica ovalis (Figure 2) has not previously been reported from striped bass. Merriman (1941), in a list of all known parasites of this fish, did not include it although he did mention other exoparasites including copepods and molluscan glochidia. Raney (1952) also omitted it. However, two other occurrences of *Livonica* on striped bass have been observed or brought to the author's attention.

[1]A contribution of Federal Aid in Fish and Wildlife Restoration Project F-15-R.

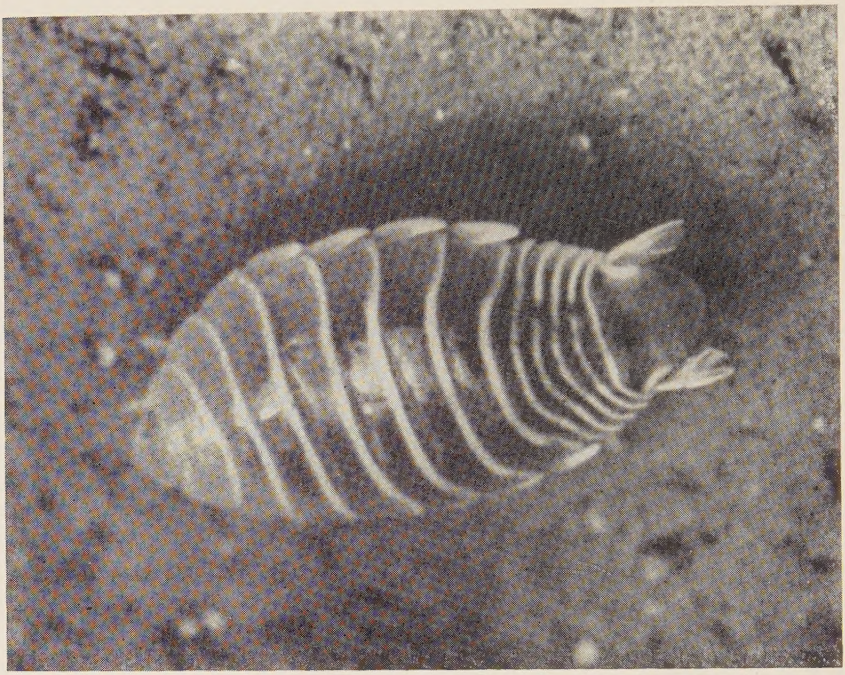

Figure 2. Example of *Livonica ovalis* (approximately 35 millimeters in length).

Among more than 5,000 specimens examined by the author between 1961 and 1964 from collections along the south shore of Long Island, one *Livonica* approximately 35 millimeters in length was recorded from a 6-pound bass. A second large isopod of this species was taken from a large striped bass caught by a surfcaster along Westhampton Beach in September 1963 and sent to the Bureau of Marine Fisheries for identification.

Richardson (1903) and others have described *Livonica* from a variety of marine fishes, and Miner (1950) listed *L. ovalis* as a parasite of bluefish (*Pomatomus*), sawfish (*Pristis*), scup (*Stenotomus*), weakfish (*Cynoscion*), sunfish (*Mola*) and others. Locally, *Livonica* is common to abundant in the opercular openings of young (snapper) bluefish and has been observed by the author from menhaden (*Brevoortia*) and kingfish (*Menticirrhus*).

The effects on the condition or survival of fish parasitized by *Livonica ovalis* are unknown. However, in eastern Asia, a related species, *Ichthyoxenon* (*Livonica*) *amurenis*, which lodges in a depression in the body of a fish under the pectoral fin has been described as harmful to its hosts (Petrushevski and Shulman, 1961). Akhmerov (1939, 1941) described the ecology of *L. amurenis*, and Krykhtin (1951) found that it retarded the growth of *Leuciscus waleckii* (a valuable coregonid food fish) in the Amur River and caused deterioration in its condition. Krykhtin estimated that 13 per cent of the fish die before reaching marketable size as a result of infestation by this parasite. It is interesting to note that *Livonica amurensis* occurs primarily in fishes 1 or 2 years old, and that locally *Livonica ovalis* is generally associated with young fish, being most often observed on juvenile bluefish.

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